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LYMPHATICS

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APPLIED ANATOMY OF THE LYMPHATICS

BY

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TORONTO

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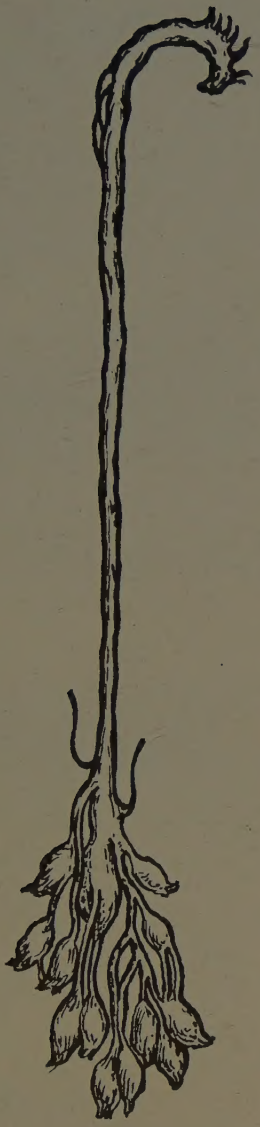

Thoracic Duct

Affectionately Dedicated
To My Friend
Carl P. McConnell, D. O.

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THE AUTHOR
F. P. MILLARD, D. O.

PREFACE

Realizing that we are writing upon a subject that in some respects is new to the world, we enter upon the discussion of the lymphatic system in a spirit of respect for the field of thought that reflects research activity. As far as we know, this is the first comprehensive attempt that has been made to outline a method of diagnosis by palpation of the lymph nodes of the body. We desire in this treatise to emphasize, first, the applied anatomy of the lymphatics, second to demonstrate the possibility of determining the stage diseased organs and tissues are in through a method of palpation of lymph nodules at strategic points, and third to outline a method of clearing the system of toxic products through specific work on nerve centres that directly and indirectly reach the lymphatic nodules and vessels. The text books on anatomy so far have given but meagre information on this great system, and physiologists give us little to go by in touching upon the function of this subsidiary system of circulation, that is, in reality, of more significance in some respects than that of the vascular system conveying the great blood stream.

We have been fortunate in securing a number of specialists to assist in giving their experiences in dealing with this system, as applied to specialized areas. They have noted certain findings in their research work, and have collected data, and have written for this book such facts as they can corroborate in their daily clinic work as specialists.

It is hoped that this little book will be welcomed by those who are students of the human body, as all physicians should be, and that within a few years at the most we can add much to our findings, and record them in a new edition, that will be much larger and more complete.

In making the original drawings to illustrate the text, the author has had no precedent, in many instances, and has had to rely upon dissections and in some instances autopsies. In time we may find that we have only touched this great subject, but we will present as best we can our findings thus far, and only hope that at some future date we may understand more fully a system that deals so directly with diseased conditions, and is so closely allied with all pathological phases.

We will try and not cover the ground that anatomists so far have outlined, but will deal as directly as possible with the more important phase namely, the applied anatomy of the lymphatic system.

We wish to express our indebtedness to Drs. Bush, Edwards, Forbes, Deason, Collins, Reid, Muttart, Snyder, Ruddy, Moore, Downing,

Ashley, Laughlin and Bailey for their assistance in making this book instructive and original; and to Dr. A. G. Walmsley for editing the book.

To Miss Logier we wish to add our appreciation for assisting in making water washes of the original drawings I have made in order that half tones might be used to clarify the text.

F. P. MILLARD, D. O.

Toronto,
Oct. 8th, 1921.

INTRODUCTION

Outside of surgical references, very little has been written on this subject. The references found pertain to nodes being involved in cancerous conditions, and the spreading of the disease to adjacent nodes and channels, but we have to deal in ordinary practice with nodular involvement relative to disorders not necessarily of a malignant, specific or tubercular nature. The majority of disturbances and organic involvements, from colds to fevers, have a bearing upon the lymphatic system, as it is quite impossible to consider any organic disturbance that does not include a lymphatic change.

Viewing the lymphatic system in its entirety, as a complete system within itself, we may be surprised when we recall its important relationship to almost every tissue and organ. Just for a moment separate, in your mind, this system from the vascular and see how complete it is. The part the lymphatic system plays in its close relationship to the tissues in nourishment, assimilation, secretion, and elimination or purification, the part this system plays in infected areas, and the immediate activities of the nodes and channels whether a finger is cut or a heel bruised, the long tinted lines on the arm when blood poison has started through an infected abrasion of finger or hand, the checking up and collecting of septic materials that help to prevent sudden poisoning, and greatest of all the necessity of perfect vascular normality to assist the lymphatics functioning better under stress.

The vasomotor arrangement in relation to the nodes and large ducts, and the nerve centres from which impulses come are included in this picture of the complexity of this wonderful system.

We can but touch the bare outline in a book of this size, but we hope within a few years to have worked out a more or less complete applied analysis of the disturbances and relations of the lymphatic system to the muscles, ligaments and organs that are closely associated with them. In the head and neck alone there are numerous disturbances that reveal lymphatic disorders, when we pause to think of the relations of the lymphatic nodes and channels that become involved through lesions of an osseous nature. There are few areas that have no lymphatics, very few. The lymphatic system completely separated from the body would be an amazing spectacle.

Sensitive to a degree, and carrying diseased nodular infection ofttimes without enlargement of palpable significance, this system is more or less constantly charged with infectious material or septic poisoning.

The function, in part, of this system is to purify or clarify the contents of its nodules, channels and ducts.

The enlarged nodes are often at a distance from the point of infected abrasion or tissue poisoning.

Obstruction of the vascular system is but an occasion for lymphatic inactivity and nodular trapping.

The unstable vasomotors through lesions, congestion or thickened tissues, throw upon the lymphatics great responsibilities.

Organic irregularities cause this system to become more or less blocked and taxed from the points of infection to the termination of the ducts.

The regurgitations often referred to in gastric and other organic centres spell systemic symptoms and tissue derangements.

In previous articles in the A. O. A. Journal we have pointed out the value of associating enlarged nodes, through palpation, with adjacent or even distant sources of tissue or organic infection. The blisters on the heels, or soft corns, and inter-phalangeal abrasions that invariably cause popliteal lymphatic enlargement, usually with tenderness, are examples. Sometimes even the inguinal glands are noticeably involved, as careful palpation reveals.

We used to consider femoral and inguinal nodular enlargements due to pelvic congestion or venereal troubles, but when we remember that this region is the drainage point for all points below, we have to admit the possibility of pedal infection involving these nodes.

Likewise, in hand or finger abrasions with infection, we may notice a glandular involvement of the axillary nodes, and in some instances the cervical. This may arouse suspicion regarding the mammary region, but not necessarily, although a secondary disturbance may involve the pectoral region. When the axillary nodes are readily palpable it will be well to examine each finger and thumb around the nail and its matrix, also between the fingers, to see if anything from a cuticle abrasion to interdigital cracks are present in the skin.

Any source of infection should be handled immediately to prevent strain upon the lymphatic system that is usually already burdened in the ordinary system.

Few people are in such good health that they have normal lymphatic channels and lymphatic fluid. Every abrasion of the skin, every abscessed tooth, every diseased tonsil, sluggish organ and congested area means a more or less irritated and overburdened lymphatic stream. Minimize this strain and teach patients the importance of keeping the skin free from abrasions.

Many a system has been taxed by repeated manicures when a careless person has left the cuticle bleeding or raw. We have all seen cases where the fingers were a bit swollen and angry looking from too close cutting of the cuticle or tearing out of a "hang nail". Slivers allowed to fester tax the lymphatic system in that region. Absorption following abrasions is always constant and present, and a cat or dog scratch may show up at distant nodes and cause a systemic poisoning that may produce anorexia or nausea, if not more serious result.

There are no such things as trifles in the way of abrasions. Septic poisoning even in a small degree may follow. Some are heedless to abrasions and only laugh at them, and give them no attention. Little has been written upon this subject for the lay mind and therefore a lot of systemic disorders have gone by unnoticed. It is only when evidences of blood poison are noticed that people begin to think of the seriousness of an infected abrasion. To my mind, proper care of the skin is most significant if the body is to be kept up to a normal standard.

Fortunately, gum boils are no longer laughed at or scorned, but people have their teeth X-rayed, thanks to progressive dentists and physicians.

In the following chapters we intend taking up the applied references to 1st, the head and neck; 2nd, the region of the intercostals, and 3rd, the abdominal and pelvic regions. We illustrate these chapters with original drawings.

THE EDITOR
A. G. WALMSLEY, D. O.

EDITOR'S PREFACE

It has been my privilege to be closely associated with Dr. Millard and his work for a number of years. Six or more years ago, before he had written on the subject of Lymphatics, he outlined to me his theories of lymphatic diagnosis in certain pathological conditions. At first the thought was new and I was inclined to be skeptical, but as the subject opened up I began to see the logic of the theory. Since then Dr. Millard has given much time to the study of the lymphatic system, and this work is the outcome of his studies and researches.

The first five chapters of the book are by Dr. Millard. In these chapters the applied anatomy of the lymphatic system is discussed in the various parts of the body. These chapters merit careful study, not only because they present many valuable thoughts on the subjects under discussion, but because they lay the foundation for a better understanding and appreciation of the thoughts presented in later chapters by other writers.

Dr. Millard's penchant for illustrating his writings, and the attractive, convincing manner in which he does it, has always made his writings highly acceptable to the profession. In the present volume no effort nor expense has been spared in this respect, and the value of the work is greatly enhanced because of the graphic manner in which it is illustrated.

While the title of the work is Applied Anatomy of the Lymphatics, it contains so much new and valuable data on the treatment of the lymphatics that no busy and progressive practician can afford to be without it. Some of the specialists who contribute to the work devote as much or more attention to a discussion of treatment as they do to anatomy, but it is worthy of note that in every instance they first review the anatomy of the part in order that they may emphasize the anatomical reasons for the treatment outlined.

In bringing out this work, it is not claimed that the last word has been said on the subject presented, or on any phase of the subject. It is in the nature of research work, and it is hoped from time to time to add new facts to our knowledge of the lymphatic system.

A glance at the chapter headings may create the impression that there is much repetition in the work, but this is not so. Each writer presents his subject in a different way, and each writer brings out and emphasizes facts not brought out by the other writers.

The attitude of the average physician toward the subject of lymphatics is one of aloofness. It is too intricate for him; it would require

more study than he could afford to devote to it, he thinks. Now, this is not so; it only SEEMS so. I am happy to say that the subject as presented in this book is not only easy to understand, it is simple and attractive. Indeed, the subject is so attractively presented that the physician in perusing it will be doubly repaid in that he will, while being edified on the subject of lymphatics, at the same time get a splendid review of general anatomy.

The past few years have witnessed what might almost be termed a revival of faith or belief in the principles on which the science of Osteopathy is founded. There were those who faltered, who were carried away by the siren call of other systems, especially the drug system. This, really, was a passing phase in our professional and scientific growth, a sort of "growing pain." The underlying reason for such defections is, that many of our profession spend much time delving into medical texts and little time pondering the writings of the founder of Osteopathy and of other capable writers in our ranks. It is well to know medical theory, but if we would attain the highest measure of success in our practice, we must be firmly grounded in the osteopathic theory and the application of that theory. To accomplish this we must study osteopathic books.

The osteopathic physician who will study this work, Applied Anatomy of the Lymphatics, will understand better than ever before why he succeeds in certain types of cases where other systems fail; he will understand better why Osteopathy is so successful in handling acute diseases; he may understand why he has, in the past, secured results in certain conditions without knowing just why results were secured.

Applied Anatomy of the Lymphatics is osteopathic through and through. In many pathologic conditions it tells us what to do, and, what is equally important, it also tells us what NOT to do. This book should be in the hands of every physician in practice and every student in our colleges. It is not only a worthy contribution to our literature, it also marks another milestone in osteopathic progress.

A. G. WALMSLEY, D. O.

Bethlehem, Pennsylvania,
March, 1922.

CHAPTER ONE

THE LYMPHATIC SYSTEM

APPLIED ANATOMY

General Outline

Students of anatomy sometimes fail to grasp the relative importance of collecting applied data as compared to that of gaining a knowledge of the tissues, organs and general framework of the human body as outlined in texts on that subject.

The physician in practice soon feels the need of greater knowledge of the various vessels, nerves and organs along the line of applied concept. As he advances in his work and studies his patients at the office and bedside, there comes a longing to know just what relation exists between the various parts of the body and the disease that he is endeavoring to diagnose. He wonders always, or should, how great an involvement is present in certain disorders where symptoms reveal specific pathological phases. In neuritis, for instance, he asks what change has taken place that has caused a normal nerve tone to be replaced by the symptoms so strikingly impressed upon the patient. He had been taught in college the general outline of the nerve tracts, their nerve root tracings and their relation to the groups of muscles. He also was taught the osseous framework and the relation of the nerves to the various bones. But in some instances he had never worked out in detail the applied part and felt that he did not understand the various stages of muscle tension as related to nerve instability and irritability. The various causes of the chemical changes in the body fluids in perverted function, such as the possibility of lymph blockage through the malposition of certain bones, and the resultant organic disorders that follow a perverted blood supply to the walls or substance of an organ, and the lack of vasomotor control in some instances. As osteopathic physicians, we are more or less familiar with this follow through system, and we reason from cause to effect. We have familiarized ourselves with the general blood circulation both from an anatomical and physiological standpoint, and then the pathological.

Applied anatomies have been written both from a surgical and osteopathic standpoint that deal with many phases from a very practical viewpoint. From these books we have learned much although we are yet in our infancy, so to speak, as to the real significance of applied work.

As mentioned in the preface no attempt as yet has been made to devote a book to the subject of the lymphatics in all its various phases.

In dealing with the lymphatics first from an applied anatomy standpoint, we do not claim in any way to be adding any new anatomical features, but we hope to enable the student to get a mental picture of the various structures so that he will more readily grasp the significance of the causation of disorders in the body when symptoms manifest themselves.

We want to emphasize, in considering the lymphatic system, the importance of any perversion of the tissues that may alter the function of any part of the body.

In the various regions discussed, we hope to assist the student in clarifying the various influences that may have a bearing upon the structures affected thereby producing tissue changes to the extent of causing some bodily disturbance.

The lesion theory as propounded by Dr. A. T. Still, will be given first place in all our discussions, because we know that his reasonings were correct and can be demonstrated in any instance where there remains sufficient impulses to carry out this idea.

We realize there are certain diseases so far advanced that the reflexes are lost and the nerve impulses so disturbed or feeble that it is quite impossible to restore normal functioning, but these cases are extreme, and we will consider more particularly those cases that are amenable to adjustment and restoration.

In dealing with the lymphatic system, let us go about it in a manner that will first of all be broad enough in outline to realize that the body is a machine that is so correlated that if one part suffers there will be a corresponding reflex that will to some degree, at least, affect other parts or all parts.

The tendency of the day is to specialize and narrow ourselves to the point of believing that any organic disturbance is a localized one, and that we must treat or deal with the affected part from a local standpoint. This must be overcome, and we must fix in our minds the fact that the circulation that bathes one part of the body one minute may be bathing a remote part a little later; that the lymphatic system is so arranged that the drainage continues to the point of emptying. The blockage at a point in the abdomen or pelvis will reflect itself upon the lymph flow possibly in the feet. We can also see how enlarged glands in the neck may cause any number of disturbances in the organs of special sense in the head.

Insufficient stress has been laid upon the points of interference with the flow of lymph, and in these chapters on applied anatomy we hope to show, in some degree, the possibilities of many diseases being existent through a blockage of the lymph flow either in the nodes or vessels.

Finally, we want to assist the student by demonstrating that in any pathological condition there is invariably a relative lymphatic disturbance, and try to show how adjustment will assist the body in clearing up the retardation or obstruction.

NEW METHOD OF DIAGNOSING VARIOUS DISEASES BY PALPATING LYMPHATIC GLANDS*

(Reprint of article by author from the Journal of the American Osteopathic Association, July, 1920)

Had Dr. A. T. Still lived a few years longer I sincerely believe he would have given to the world a vast amount of information regarding the lymphatic system. I have always felt that he had in his mind some information along the line of new physiology dealing with this subject. He hinted at the reduction of obesity by lymphatic control, and often mentioned the lack of knowledge and research in relation to the lymphatics, but we could never draw any definite conclusions as to his reasonings. One day, twenty-three years ago, I ventured to ask him regarding the significance of the lymphatic system, but he passed the subject, by simply stating that he was still experimenting along that line.

Recognizing that there was a field only partially worked out, I set about to determine if I could discover any hidden truth that might be of value to the osteopathic profession. My first observations were rewarded, some sixteen years ago, by a revelation that gave me grounds for further research. The idea was so new I did not feel like announcing it until I had satisfied myself that there was sufficient merit in the theory to warrant its publication.

Three times during the past few years I have ventured to throw out a few suggestions. One reference to the matter pertained to swellings found in the breast and their relation to axillary disturbances; a second was the inguinal disturbance found in the right groin in cases of appendicitis; and the third, published in the May number of this JOURNAL, dealt with enlargement of the lymphatic glands from outside infections and inoculations.

Allow me to state that I believe that few, if any, physicians have made it a regular part in their diagnostic work, year in and year out, to carefully examine the condition of the various lymphatic glands as a part of their examination of patients, also the following up of the state of these glands from time to time in cases where lymphatic enlargement was found. This calls for the development of a peculiar touch, as pal-

*First publication of the technique of the newest thing in diagnosis—and it is OSTEOPATHIC.—Editor, Journal of the American Osteopathic Association.

pable glands vary so much in different systemic conditions that it is almost incredible the number of phases these nodules assume.

For several years I have based, almost conclusively, my diagnosis as to the surgical or nonsurgical nature of the appendix upon the state in which I found the inguinal glands. They serve as an index to the pathological condition existing around the caecum and appendix.

As stated above, I almost hesitate to announce this new method of diagnosis and suggest that you will not criticise too severely until you have gone through a period of personal findings, and have satisfied yourself as to the merit of the method. I shall not try to cover in this article all of the diseases in which lymphatics are disturbed, but simply refer to three or four disturbances, and leave it to you to think over and experiment for yourself.

Going back to appendicitis, let me state that you will first have to familiarize yourself with the various conditions found in the inguinal region. It is well to always palpate carefully both groins, first with the limbs extended, and then flexed. When the limbs are extended, the glands, if present and enlarged, will present a different feeling than when the knees are bent.

The subject has so many phases that I find it difficult to describe in a brief article the thoughts that will bring out the most striking features. About the first thing that you will suggest is the question. How can you differentiate when there is a pelvic congestion, such as when a right ovary or tube is involved; also, how can you distinguish if there exists an infection of a venereal nature. To say that it is easy would be foolishness, but to state that skill will follow long research would be on a par with the statement that months of practice are often necessary for the student to detect some hidden spinal lesions.

We are all quite familiar with the almost set type of glandular inguinal enlargement found in gonorrhea, for instance. The nodules are usually quite enlarged and often indurated. They ebb and flow, so to speak, as the disease is acute and active, or subside with lack of congestion in the sexual organs.

I will admit that one difficult diagnosis to make is when appendicitis is conjointly found with venereal infection. Should there be simple ovaritis or salpingitis, with no venereal infection, we usually find a disturbed lymphatic condition, accompanied with certain reflexes. Ovarian colic or cramps, or a hypersensitive hypogastric plexus will enable the examiner to determine the presence of tubal congestion.

In a case of appendicitis, with apparently no complications, if pus is present and the caecal area is involved, the inguinal glands are found

slightly elevated and their nodular surfaces under the skin readily palpable. This condition I have almost invariably found and verified by judging as to the advisability of referring the case to a surgeon on the strength of the amount of nodulation.

In a test covering a period of four years, some seven years ago, I treated three hundred and ten cases, with the result that three had to be operated upon after a trial to reduce congestion. That was a small percentage. At one time I was treating eight cases that had been told to be operated upon within twenty-four or forty-eight hours. This strain was not small, as I appreciated the significance of the situation. Fortunately I was rewarded by bringing these eight cases out of danger, and I followed up the acute attacks with corrective work. I relied entirely upon my diagnosis in relation to the inguinal glands.

In the March number of the A. O. A. JOURNAL, 1916, there is a colored plate showing the lymphatic glands of this region.

The breast region is also a most significant one, in that the axillary region is so directly concerned. Surgical operations for removal are so very common that one almost wonders where it will end. It is not uncommon to find lumps or swellings in one or both breasts. The significance of these tumors depends upon the amount of lymphatic involvement of a general nature.

If you will carefully trace the channels back to the axilla in relation to the pectoral muscles, you can quite readily determine the amount of glandular involvement. If the axillary region is comparatively clear of nodules, and there seems to be no particular blocking of the connecting channels, it is usually safe to say that the lumps found in the breast are not of a malignant type, and may be reduced indirectly by corrective work. As a rule, malignancy of the breast follows axillary warning of some duration. Traumatic injuries of the breast should be attended to at once, as the tendency is toward circumscribed induration, with secondary lymphatic complications.

Possibly the most patent instance of lymphatic abnormality is found in the throat.

We are all familiar with the "kernels," "lumps," and peculiar nodular enlargements found in children as well as in adults accompanying various epidemics and tonsillar infections. In children we have a range of swollen glands, from those found preceding measles, chickenpox, etc., to those noted in scrofular and tubercular diseases. Accompanying a simple rhinitis we often note a marked disturbance, while in tonsillitis, even in the adult, there may be a most aggravated lymphatic disturbance.

One more instance and we will close this abbreviated article.

The final reference is to septic infection of the lymphatics of the popliteal space by absorption of material, including perspiration, dirt, and dyes from stockings, through soft corns and skin abrasions between the toes. We are all familiar with blood poison and lockjaw from plantar punctures by rusty products, with dirt and cloth carried into the wound. The resulting symptoms may include lockjaw.

Examining carefully the popliteal regions, in all cases where a general examination is made, I have frequently observed enlargement of these glands when this space should be comparatively clear. Upon removing the stockings or the socks, as the case may be, I have found in a number of instances skin abrasions between the toes. Through these cracks or denuded slits perspiration, dust, or dyes are constantly being absorbed, and the resultant effect is noted upon the nodules in the space behind the knee. After instructions, and the careful healing of these tissues between the toes, I have noticed the disappearance of the nodular swellings.

This last reference does not pertain to the diagnosing of a hidden trouble, as in the instance of pelvic and breast involvement, but carries out my idea that infection of a part is invariably manifested by nodular interference at the nearest gland center.

Some other time I may write on other findings, especially the determining of the degrees of tuberculosis by lymphatic enlargement, according to the region of the body diseased, but I have given you my ideas in part as to the possibility of diagnosing more accurately the degree of infection or accumulation of toxic products by lymphatic manifestations.

A LYMPHATIC EXAMINATION

This is an innovation. We have been accustomed to general and special examinations, but to set out to make a lymphatic examination is a new departure.

We have made a chart blank that outlines the points where the physician is most likely to find lymphatic variations and disturbances.

First of all, let us consider the lymphatic system as a whole—a general circulation, yet subsidiary to that of the vascular system.

We find that there is a field for applied anatomy of the lymphatics just as of other tissues of the body. We find lymph blockage and nodular enlargements, hyperplasia and adenitis, also in some instances a backing up and a reverse in the flow of lymph. This has been described in connection with the gastric lymph vessels by noted surgeons.

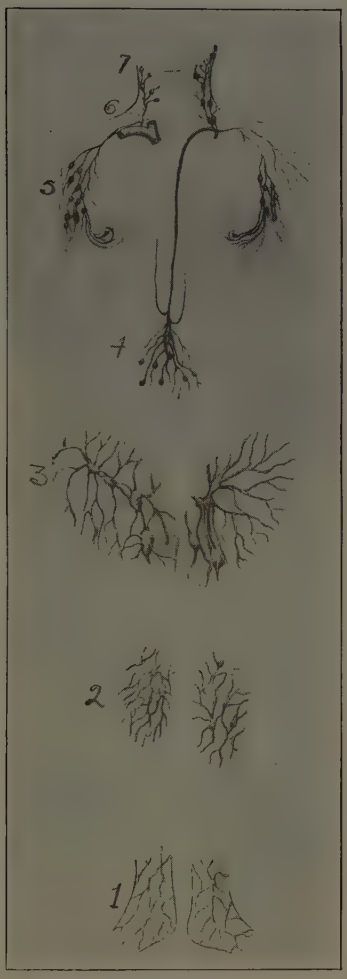

PLATE I.

Seven points of palpation in making a lymphatic examination.

There is an ebb and flow, so to speak, in the lymph stream. To illustrate this point we will note that when there is mesenteric blockage or pelvic lymph nodular adenitis a corresponding disturbance is found in the lymph areas of the popliteal space; also a slight edematous condition in the ankles, usually on the outer side just in front of the external malleolus. Again we note where there is a puffiness above the clavicles, on one side or both, a corresponding blockage of the lymph stream exists either at the emptying point of the thoracic duct and right lymphatic duct, or we will find an over-burdened thoracic duct from too much tension or too great an accumulation of lymph. The system is constantly trying to clear itself and the clearing house is partly made up of the lymphatic system.

Again we note a puffiness around the eyes. There is a cause for it. If we trace the lymph stream, we will soon discover that there is a blockage in the cervical nodes, or possibly the submaxillary, or nodes in the parotid region. There may be lesions causing tensed muscles that prevent a free drainage. In all of the lymph nodes and vessels in the throat and neck there is a possibility of blockage.

There is also a possibility of lymph obstruction through the enlargement of the salivary glands or a subluxation of the mandible or hyoid bone. The puffiness of the eyes may be due to over-burdened kidneys, and an enlarged liver. Disorders of the spleen may also cause it when the system is loaded with toxic products and elimination is faulty. We may look then for a lymph stream blockage and puffy areas in certain regions. Thus we see it is well to examine for areas of lymph obstruction where there are evidences of edema.

Now that we have this viewpoint in mind, let us proceed to make our lymphatic examination. With the blank before us, we will start always at the emptying points of the lymph tubes or ducts. On both sides these ducts empty into the subclavian veins. If the drainage is fairly perfect there will be no puffiness above the clavicles. If there is a blockage or over-loading, we will observe edema.

Let us take the presence of edema on the left side and work out our examination and diagnosis. The second point we will note will be the axillary region (No. 5). Note any nodular enlargement or adenitis, and if present trace out the cause. See if there has been a recent scratch or abrasion of the skin on arm, forearm or hand. If there has been, note the presence or absence of pus or even a blister. Also note the vasomotor tone in the entire arm. Cold hands affect the lymph stream. Should there be signs of a recent vaccination or serum injection, determine the amount of axillary adenitis that existed at the time.

Next, palpate over the mammary region and note enlargement of nodes and extent of induration if present. Connect up the arm and pectoral regions, lymphatically speaking, and determine which area was first affected and to what extent.

Note carefully what quadrant of the breast is nodulated, and whether they are deep seated nodes or superficial. Go over the thoracic vertebrae and costal areas, and determine the number and significance of lesions. Adjustment of vertebral and costal lesions may clarify the nodular enlargement if no abrasions or recent vaccine or serum injections have taken place. We will go back to the neck now and palpate for superficial and deep nodular enlargements (No. 6). Note presence or absence of goitre, and determine if there have been recent symptoms of laryngitis or pharyngitis. The presence of muscle tension and venous stasis will be of value in tracing the lymph blockage. Corresponding bony and muscular lesions may be found, and lymph nodes enlarged to the extent of irritating the nerve cords in the neck. If there exists any congestion of tissues due to tonsillitis, abscessed teeth or sinus infection, note the effect on the cervical lymph nodes. Determine, if possible, the amount of lymph suspended and retained in the vessels and nodes at all points above the hyoid region (No. 7). After testing and palpating the various nodes and edematous areas, including the tonsillar and faucial areas, try and determine the relation of this blockage to that found in the terminal area, back of and above the clavicles.

Again, we note the lack of drainage, if present, from the bronchomediastinal trunks. Following bronchitis or a pleuritic infection, there may be a difficult drainage that will reflect itself upon the tissues above the clavicles. How often in throat and bronchial troubles we note not only cervical nodular enlargement, but that peculiar puffiness above the clavicles which is so hard to reduce unless we reason out just why this blockage exists, and drain the lymph vessels.

In this brief chapter we must necessarily point out only a few of the cardinal points. A thorough examination including all applied anatomy findings would fill a book.

We will recall our anatomy teaching regarding the collection of lymph on the two sides. This will explain the suggestion just made that more often we find edema in the left supraclavicular region.

The epigastric region we will next discuss briefly (No. 4) The liver, from a lymphatic standpoint, is more significant than the spleen. The tendency of the liver to enlarge and become torpid and sluggish makes lymph drainage uncertain. Part of the liver's drainage is above, and eventually empties into the right lymphatic duct or indirectly into

the thoracic duct in part. The principal lymph vessels drain into the thoracic duct along with the drainage of the stomach.

If the patient is thin, you will observe on palpation a peculiar enlargement of the receptaculum chyli when the knees are flexed. Sometimes you can palpate the larger nodes and you can press the abdominal aorta so readily against the receptaculum chyli that you can cause the pulse beat to fluctuate. I have palpated the receptaculum chyli when it could almost be picked up with the finger tips in a thin person when there was a heavy mesenteric blockage.

Splanchnoptosis and venous stasis combined with ovarian congestion or appendicitis, will soon prove to you the great amount of blockage that takes place in the receptaculum chyli and thoracic duct.

In pelvic congestion the nodes are markedly enlarged, as you will determine by special local examinations, vaginal and rectal. The inguinal glands (No. 3) will reflect not only pelvic congestion but appendicitis. The lymph blockage of the mesenteric glands and in the receptaculum chyli will reflect itself upon the inguinal glands by a blockage of lymph.

Lastly, we will go briefly over the lower extremities. Palpate over the popliteal space (No. 2) with patient on the back, and then with patient standing. You will find a new viewpoint when you make this double test.

Look for varicose veins, even small ones; also palpate the calf muscles deeply between thumb and fingers and determine presence or absence of stasis. Recently I noticed a lymph disturbance in inguinal region due to a bruise on the thigh; also a popliteal lymph enlargement due to a soft corn. Go over the ankles (No. 1) and look for any swelling that would indicate a lymph blockage higher up. Again, note vasomotor tone in blood vessels and observe the effect upon the lymph nodes in popliteal and inguinal regions.

Summary

1. For every congested tissue there is a corresponding lymph disturbance.
2. Wherever pus is present there is enlargement in the nearest nodes.
3. An abscessed tooth or even a pimple or small boil will reflect itself on the nodes.
4. The lymph stream ebbs and flows according to the amount of blockage and nodular enlargement at certain points.
5. Edema is significant of lymph blockage.

6. Nodular enlargement is not always between the terminal lymph drainage and distant disturbance.

7. There may be a backing up of lymph and a reverse flow in spite of the numerous valves.

8. Collateral lymph circulation may take place when indurated nodes or blocked lymph channels exist.

9. There is a direct and an indirect vasomotor control of the lymph stream.

10. Enlarged nodes may irritate or over-stimulate nerve trunks.

11. Vaccines and serums are as direct causes of nodular involvement as poisons taken into the system.

12. The lymph stream must always be drained first through the terminal areas.

13. Attempts to clear the lymph stream before clearing the edema in the clavicular regions is to over-tax the general lymph stream and cause profound reactions.

14. Any permanent results in treating the lymphatics must be accomplished through the nerve centers that control the vasomotor nerves of the blood vessels in the same region as the lymph blockage.

15. Never work over an enlarged or indurated lymph node—free the efferents and the lymph will drain.

16. General exercises will stimulate lymph flow, but if there is marked lymph blockage it is better to relieve the lymph tension before exercises are given. This will save marked reactions.

17. In treating the extremities, see that the axillary and inguinal regions are cleared first.

18. The only way to clear bronchomediastinal lymph blockage is through cervical and thoracic adjustment. Deep control can only be reached in that manner.

19. Indurated nodes may never reduce. Establish drainage and collateral flow will follow.

20. Note from time to time the various accessible lymph areas in any and every organic disturbance.

21. Learn to palpate nodes in every region where they are accessible.

VENOUS STASIS AND LYMPH BLOCKAGE

In school we used to spend a few days on the subject of lymphatics. Five years from now, or less, students will receive daily instruction on this subject. It will be embodied in texts on applied anatomy, and each organ and area will be considered from a lymphatic standpoint. Under the discussion of every diseased organ or tissue a few paragraphs will be included referring to lymph drainage. We have devoted much time in the past to a study of the vascular system in all its details, but have neglected to a great extent the tracing of lymph flow and in accounting for edematous areas that indexed the amount of venous stasis and lymph blockage that existed. We have paid so little attention to the lymph stream that we have not gone beyond a few findings in two or three regions, usually the cervical, axillary and inguinal.

Let us spend a few minutes going over the principal findings that should be included in every examination, and at every treatment. In the first place, wherever there is venous stasis there is bound to be lymphatic disturbance.

We will take the mesenteric region first. We recall the innervation and vasomotor control of the vessels in this area.

With the osseous lesions that may cause an interference with peristaltic action, secretion and vasomotor control, we are familiar. If there is ptosis and stasis we must naturally expect lymph blockage. The receptaculum chyli that drains this region is readily blocked when the above conditions exist. We cannot expect to correct these changes in blood and lymph streams unless we first of all correct the ptosis. Organs that have sagged cause pressure on vessels and lymph channels. Neither can we expect to free lymph drainage unless there is a normal thoracic duct passage. If there exists a puffiness back and above the clavicle on left side we must see that the edema is reduced before we attempt drainage at a point in the region of the receptaculum chyli. This will necessitate correction of lesions from the cervical area down to the pelvis. It would be useless to correct cervical and thoracic lesions if a sacrum was tilted sufficiently to cause an unbalanced spine. We must also work to restore normal impulse to the mesenteric vessels in order that venous stasis will disappear. Normal relations will come about only by correction of all lesions causing ptosis and misplacement. A sagged stomach dragging over the thoracic duct and receptaculum chyli will interfere with lymph drainage.

Venous stasis must be cleared up by securing first of all a normal liver condition. Any lesions affecting the various functions of the liver

will check the clearing of the veins and lymph vessels. It is in this region that we find the many tumors, benign and malignant. The lymphatics are involved, the nodes enlarged, and lymph vessels obstructed. If you want to see this object lesson make a few post mortems in cancer of stomach or associated parts and observe the lymph blockage.

While venous stasis is relatively important, yet we believe lymph blockage the more significant in foreign growths and in congestion.

While venous stasis may precede lymph blockage, yet it is the lymph disturbance that spells disaster to the tissues. In the final analysis the veins are much less important in relation to a pathological phase than are the lymph vessels and nodes. It is easier to re-establish venous drainage than lymph drainage.

The nodes once enlarged and indurated are not easily reduced. True, the lymph vessels have valves more numerous than the veins, but they also have a lesser calibre and the lymph flow is constantly checked by the flow through the nodes. While some nodes have vasomotor nerve fibres, the blood vessels are much better supplied with these fibers. Thus we have to contend in lymph blockage first, with a venous stasis that must be cleared, then a lymph drainage that must include a reduction of the nodes when enlarged, and a free lymph flow at the terminals of the lymph ducts. The blood vessels that supply the nodes may have vasomotor nerves, but we must depend in freeing the lymph stream upon indirect vasomotor control through the nerves to the vascular system. The vasomotors to the nodes are not constant. Again, in order to clear the lymph stream in the mesenteric region, we must consider the possibility of an unusual lymph flow from the pelvic region. If this exists there will be found an additional tax upon the receptaculum chyli from the lymph below, and this additional burden upon the thoracic duct in cases of pelvic disturbance will make mesenteric drainage more difficult.

Normally, the receptaculum chyli and afferent ducts are sufficiently taxed, but abdominal and pelvic venous stasis will overtax the lymph stream in every instance. This will reflect itself upon the lymph drainage of the various organs in this region and only the insurance of a normal venous and lymph flow will clear the area and remove the tax upon the lymphatics of the receptaculum chyli.

The majority of ailments of the human body have their beginning in the epigastric region. A sluggish, inactive liver may start a stasis and lymph blockage that will reflect itself upon not only the immediate organs and tissues but, by blockage, prevent pelvic drainage of the lymphatics. We will then note a little puffiness in the ankles, a similar

condition back of the knees in the popliteal spaces, and unless we free the ducts and chyli nodes, the edema will persist.

It is easy to block drainage below the second lumbar segment. An obstructed alimentary tract will produce lymph blockage very nicely. A lessened vasomotor tone will also block the lymph vessels and nodes when venous stasis is present.

There must be tone and there is only one way to get tone, and clear the congestion, and that is by good technique and specific corrective work.

You will recall the peculiar vasomotor control in the mesenteric region. The second relay, so to speak, to give extra impulse to the mesenteric vessels. This will call for lesion findings, and corrections higher up than is usually found in other organic disturbances.

It is well to re-read anatomies occasionally and keep in mind the nerve centers that control the vasomotors. It is through these nerves that we make headway in clearing stasis and secondary lymph blockage.

In this brief chapter we can discuss only one region, but we have tried to emphasize a fact that may be applied to any lymph area, namely, that a venous stasis will invariably cause a lymph blockage. We have not included in this chapter conditions where lymph obstruction may be primary, such as direct poisoning of the system through introduction of vaccines, serums, or ptomaine substances. This phase of the subject must be dealt with from a different angle.

CHAPTER TWO

APPLIED ANATOMY OF THE LYMPHATICS OF THE HEAD AND NECK

General Statement

The arrangement of the lymphatics in the neck are such that there is every possibility of a checking or blocking of the lymph flow through lesioned vertebrae or muscular tension.

There is also the fact that the blockage of lymph nodes or vessels in the neck produces hyperplasia of the lymph tissues in the head. The deeper neck glands may be enlarged for a time quite distinct from the enlargement of the more superficial glands.

While the superficial and deep glands are closely connected, and their drainage point remains the same, yet through throat infections or cervical lesions the one set may become involved before the other is affected.

The relation of the nodes to the nerves and blood vessels is significant. If sufficiently enlarged they may produce pressure sufficient to create undue stimulation on nerves passing through the neck, resulting in accelerated heart action or bronchial and gastric irritation. This may be a new application or viewpoint, but may be demonstrated in the clinic room.

The enlargement of nodules may interfere with salivary secretions through pressure and cause a dry mouth or lack of saliva. Enlarged glands may block the capillaries and veins and produce a flushed face. This point may be demonstrated when the patient has a cold and the glands in the neck and under the rami of the inferior maxillary are enlarged.

In the chapters written by the specialists on eye, ear, nose and throat, you will find more detailed statements regarding these points. In this chapter we outline in a general way the possibilities of interference and blockage through lesions in the same respect as we treat lymph flow interference in the chapters dealing with the rest of the body.

We want to make it plain that in order to correct any disturbance in the head we must look well to lymph drainage at every point where there is a possibility of obstruction.

Lymphatics of the Tongue

The tongue has more nerves, vessels, lymphatics, and variety of functions than any organ of its size in the body. The lymphatic drain-

age of the tongue includes vessels and nodes that carry away the lymph individually and collectively. As in the innervation the tongue seems to be divided into sections, so in the lymph vessels the drainage is quite distinct and separate, yet all channels lead to the deep cervical glands in the region of the beginning of the two carotid branches from the common arterial trunk.

The submaxillary lymph nodes collect lymph from the free end of the tongue. The deep cervical nodes collect from the nodes on the hypoglossus muscle. These later lymph channels follow the ranine vein. Beneath the epithelium of the tongue, the lymphatics have their beginning. In the base of the tongue the lymph vessels connect freely, while in the free portion there is quite a distinct individual drainage.

There are small lymph vessels originating in the muscle of the tongue, but the submucous vessels are in the vast majority. This lymph network is so arranged that the vessels are readily drained unless there is blockage in the nodes, especially in the submaxillary region. The submental lymph glands receive a part of the drainage. Small lymph vessels from the tip of the tongue perforate the mylohyoid muscle in some instances, and end in the node above the hyoid.

The lymph nodes just above the omohyoid receive some lymph vessels. The relation of these lymph vessels to the hyoid bone and the digastric muscle is of significance. Lesions affecting the position of the hyoid bone may interfere with the drainage of the lymph, while lesions disturbing the innervation of the digastric muscles may also cause lymph blockage. This applies also to the mylohyoid muscle referred to above.

You will notice by Figure 2 that the drainage from the apex of the tongue ends in nodes much lower than does that from the base of the tongue. Where the digastric muscle passes in close proximity to the jugular vein, there are nodes receiving considerable drainage. The contraction of this muscle unduly causes blockage in the nodes and lymph vessels. There is also a large node at the point of crossing over of the omohyoid at the jugular vein: the inferior node of internal jugular. Lesions affecting the innervation of this muscle or subluxation of the hyoid, may cause retardation of lymph flow. The superior deep cervical nodes collect lymph from many lymph vessels and their obstruction through blockage in the thyroid gland region must be carefully noted. The drainage from the tonsillar region is closely connected with that of the drainage from the back of the tongue. This will account for enlargement of certain nodes when a cold or sore throat is found.

As stated above, the nerves to the tongue are unusually numerous, and the vasomotor supply through the sympathetics controlling the

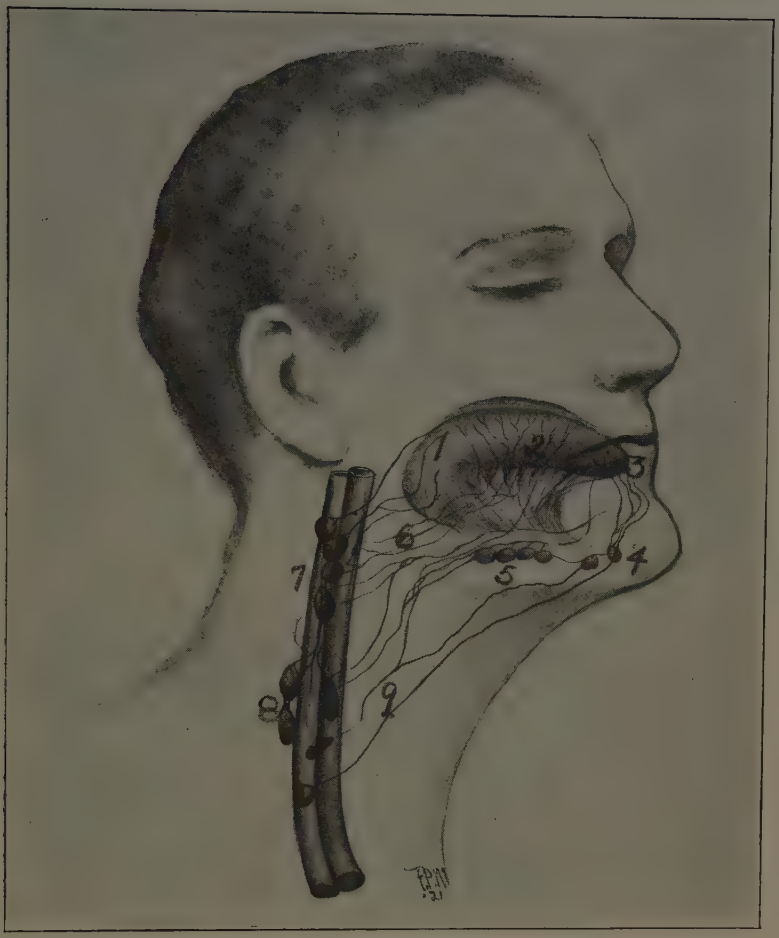

PLATE II. Lymphatic drainage of the Tongue.—(1) Lymph drainage of pharyngeal portion of tongue. (2) Lymph vessels on margin of anterior two thirds of tongue; (3) Collecting lymph vessels of tip of tongue. (4) Submental nodes. (5) Submaxillary nodes. (6) Lymph vessels conveying lymph to deep cervical nodes, 7. (8) Lower deep cervical nodes receiving lymph vessels, 9.

lingual blood vessels is a point not to be overlooked. The lingual veins are readily interfered with at certain points and if stasis or edema exists there will be interference with the lymph flow.

Treatment

To regulate the vasomotor control of the blood vessels in the tongue, we must first of all see that the muscles of the tongue are not disturbed through lesions that affect the innervation of these muscles.

Any cervical lesion, or even upper thoracic, may cause a vasomotor instability. The hyoid bone may be slightly or markedly out of alignment through traumatism or extreme lateral muscular tension. Lesions affecting the scaleni muscles may cause costal traction of the first or second ribs and produce a blockage of the lymph at or near the terminals of the lymph vessels. The slightest amount of blockage in the lymph nodes and vessels will back up or check the drainage from some portion of the tongue. The arrangement of the lymphatic vessels from the tongue is unique in that there are so many separate channels and distinct areas drained through different sets of nodes. The vessels from the anterior part of the tongue pass through different sets of nodes than do those from the basal part. Eventually, they collect in the cervical nodes that convey the lymph to a common terminal in the veins on either side. The lymph vessels from the tongue pass or pierce muscles continuously, and any tension on these muscles, or any enlargement of the salivary glands, will cause more or less blockage.

The tongue possesses such unusually good blood and lymph drainage, and from the fact that it is such a movable organ, we find very little trouble or disease, especially of a malignant nature. There is, however, a possibility of one or more of the nerves becoming lax in their tone and causing symptoms so well known to all physicians.

The condition of the deep cervical lymph nodes is the most important consideration, as the numerous lymph vessels from the tongue to these deep centers are so varied that blockage is not likely to occur sufficiently to prevent a marked checking in the drainage until the deep glands are reached. If they are blocked, there will be a checking of the lymph streams in the numerous vessels entering the deep nodes.

Lymphatics of the Thyroid Region

In order to understand clearly the drainage of the lymphatic system of the neck and head, we will begin with the thyroid gland and discuss the lymphatic drainage in this the lowest region.

The prevelance of goitre in certain districts has never as yet been clearly explained. There are many theories and it does seem in many instances that drinking water has an influence upon this gland in a chemical way. The different kinds of goitre that are found tend to complicate matters, as there has been no explanation, satisfactorily given, as yet, as to why one person should have exophthalmic goitre and another person a cystic goitre. Anatomically, we know that the thyroid gland contains many lymphatic vessels and that they are often large in size. These lymph vessels must have drainage finally into the lymphatic ducts at the junction of the jugular and subclavian veins. The thyroid arteries, the superior and inferior, supply the gland and receive vasomotor fibers from the cervical sympathetics. The relation of the arteries to the various structures in the neck are such that there is usually little interference from muscular tension, but there may exist cervical lesions that cause undue disturbance of the innervation to the vessels in the gland. We are undecided as to the vasomotor control, directly or indirectly, of the lymphatic vessels and glands in and around the thyroid, but we believe, from clinical evidence, that these lymphatic vessels are influenced, indirectly at least, through the middle and inferior cervical sympathetics.

Cervical treatment, including springing of the vertebrae that influence the middle and inferior cervical sympathetics, will oft times reduce some types of goitre without any manipulation directly over or around the thyroid gland. This would seem to indicate that while the vasomotors of the thyroid blood vessels are directly controlled, the lymphatics as well are at least indirectly reached. It would be quite impossible to reduce an enlarged thyroid gland by controlling the vascular system only if there existed lymph blockage that was causing a portion of the enlargement. In goitre cases there is interference of the drainage in the right lymphatic duct, as well as the thoracic duct at their points of emptying. This may be verified by the edema that is so often noticed above the clavicles and laterally to the thyroid gland. Further proof is found in the enlarged cervical nodes above the gland through blockage or lack of proper drainage of lymph into the veins.

The nodes located at the termination of the common carotids collect part of the lymph from the thyroid. There is also a node or two anterior to the larynx just above the thyroid gland that collects a portion of the lymph.

In front of the trachea there are a few nodes that collect from downward coursing lymph vessels. The recurrent laryngeal nerve lies in the path of a small number of nodes that collect from the sides of the thy-

PLATE III. Lymphatic drainage of the Thyroid Gland and Larynx; also the thoracic duct receiving the lymph from the cervical nodes.

roid gland. In certain cases of laryngeal cough and laryngitis we have found that these nodes seemed, when enlarged, to press and irritate the nerves, and when reduced, and the lymph vessels drained, the cough subsided. There is no doubt in my mind but what indurated or even enlarged nodes, not hardened, cause a great deal of disturbance to nerves in the course of these nodes. We will discuss later the effects of the deep cervical or internal jugular nodes in their relation to the pneumogastric nerves and brachial plexus.

The deep cervical nodes and channels above the thyroid collect and conduct downward the lymph that clears the vessels in the thyroid gland. In some instances it would seem that goitre was a lymphatic disturbance. If, for any reason, the thoracic and right lymphatic ducts are blocked at their terminals there must be a checking also of the drainage of the lymph vessels in the thyroid gland. The lymph vessels are numerous in the gland and their drainage course is in two directions at least, an upward, or ascending, and a downward or descending. Then there is the additional lateral drainage. Disturbed innervation to the thyroid gland and blood vessels must have a bearing also upon the lymphatics in the thyroid. This may amount to a poisoning of the substance of the thyroid that would tend to increase its size. Draining of the lymph vessels certainly reduces the size of the goitre.

Treatment

The lesion theory is very applicable in this instance. Drinking water, nervousness, or other influences, may have caused the thyroid to enlarge, but in every instance where goitre is present we have found one or more osseous lesions that had a bearing upon the case. Usually there are upper thoracic lesions with a corresponding interference with the great vasomotor centre at the first and second thoracic.

It is at this centre that the circulation of the blood cephalad is controlled. The nerve fibres pass through the inferior and middle cervical ganglia on their way to the superior. As stated above, the nerve supply of the thyroid may be found in the middle and inferior ganglia. Thus we see how the drainage of the vessels in the thyroid may be influenced by upper thoracic lesions. Venous stasis always interferes with lymphatic drainage. Vasomotor changes may indirectly, through venous stasis or edema, influence and retard lymph flow. Indirectly then, in any case of vascular irregularity, the lymph stream is affected.

The upper costal attachments must be noted to determine any costo-vertebral subluxation, and the clavicles must articulate properly if we are to expect free drainage in the lymph ducts. The venous drainage

of the thyroid terminates almost at the same point as the lymph drainage, and the innervation of the thyroid corresponds with the centres for its vasomotor control.

The relation of the thyroid to the larynx and trachea, including the middle lobe, has a significance from a lymphatic standpoint. The nodes found in front of the larynx and trachea, also the parathyroid glands, that surgeons are so careful not to disturb, are often enlarged in laryngeal troubles and this nodular enlargement interferes with drainage of the ascending lymph channels of the thyroid.

Likewise, the blockage of the deep cervical chain of glands through any of the various disturbances found in the head and throat may interfere with the reduction of a goitrous condition. We see more and more the necessity of keeping the lymph flow cleared in any region where there is swelling or congestion, adjacent or remote.

First of all, in any instance, the terminals of the lymph tubes must be kept free from any interference or obstruction; second, the specific control of the vasomotors to enable the calibre of the vessels to respond to normal impulses; and third, the adjustment of all lesions to insure normal tone and regulation of nerves and vessels. It is in this same region, that of the middle and inferior cervical ganglia, that we partially influence heart action, and these cardiac nerves are often interfered with by venous stasis and lymphatic blockage through enlarged nodules and an edematous condition of the tissues. Tachycardia, so pronounced in exophthalmic goitre, may be influenced through a disordered lymph system. The close relation of the lymph in cell spaces, or pericellular areas, may in lymph blockage, have an irritating effect upon the cardiac nerves from the cervical sympathetics.

We will discuss later the ophthalmic phase in goitre, and demonstrate the bearing the lymph nodes and vessels have in their relation to those in the parotid and upper cervical regions.

The blockage of the lymph in goitre cases has a direct bearing upon the drainage of all the lymph vessels and nodes above the thyroid. This explains the peculiar symptoms noted in the organs of the head, as well as in the throat, when goitre exists. The interference of lymph flow at any place between the duct terminals and a remote area invariably means a series of lymph disturbances at the points beyond the blockage.

We have tried thus far to show the advantage of considering the thyroid region as a strategic point in the drainage plan of the lymphatic vessels in relation to points above. We will now take up the region of the larynx and show how necessary free drainage of this area is, to clear the lymph vessels and nodes above.

Lymphatics of the Larynx and Trachea

As stated on the preceding page, the drainage of all nodes and vessels above must necessarily pass by the region of the thyroid to drain into the subclavian vein. The freedom of blockage to the lymphatic vessels in the larynx will depend on the free flow of lymph below this region. As in the thyroid body, there are two sets of laryngeal lymph vessels, the superior and inferior. Their drainage course, after passing through the thyrohyoid and cricothyroid membranes, is outward and downward toward the deep cervical glands. The inferior sometimes terminates in the node lying in front of the cricothyroid membrane, or in nodes in front of the trachea in relation to the inferior thyroid artery.

These nodes, sometimes referred to as the anterior cervical nodes, lie in front of the larynx and trachea, near the anterior jugular vein. The deeper set drain the lower portion of the larynx and the upper part of the trachea. This last set also drain the upper part of the thyroid gland as already pointed out. The main collecting nodes for the lymph of the laryngeal region are located at the bifurcation of the common carotid and on the inferior thyroid artery. These deep cervical nodes lie in the course of the terminal drainage of the lymph stream from the head and neck.

Some of the lymph vessels follow the superior laryngeal artery. The larynx with its vocal cords is controlled and innervated by the superior and inferior laryngeal nerves. The sympathetic nerve filaments follow the laryngeal nerves. Control of the cords and action of the various muscles attached to the vocal box are dependent upon normal nerve impulses. The vascular supply is controlled through the sympathetics. The venous and lymph drainage insures a clearance of these various muscles and tissues.

Treatment

The tone of the nerves depends upon the freedom from pressure or irritation at any point along their course. If cervical lesions exist, causing muscle contraction or stress upon nerves and tissues, the tone of the laryngeal muscles will be lowered. If there is vasomotor interference in any way, there will be corresponding irregularity in the supply and drainage in the larynx.

Vascular insufficiency will mean lymphatic disturbance and a checked flow of lymph. Congestion of the laryngeal membranes or tension of the laryngeal muscles affects the lymph flow and this condition will remain until normal tone is re-established through the correction of lesions and the relaxation of the muscles under the jaw in the region of the hy-

PLATE IV. General scheme of lymph drainage of head and thyroid regions.

oid. Blockage of the lymph stream at a lower point in the lymph vessels or nodes, will cause interference in the laryngeal region. This will explain why we considered the thyroid gland region first. There must be an outlet for the lymph in order that the laryngeal region may clear itself.

Each nerve and vessel going to the larynx must be insured normal freedom. Any lesion that will interfere with the laryngeal nerves will cause disturbance according to the functions of that nerve. The recurrent laryngeals, with their peculiar loopings, may be interfered with by nodular enlargements or thyroid swelling, or lesions that have tensed the muscles over the course of the nerves. The vasomotors that regulate the laryngeal arteries indirectly, if not directly, regulate the lymph vessels, either at the drainage points in the larynx or in the larger vessels that receive and carry onward the flow of lymph. Here, again, we understand the cardinal point in every disease, namely, due consideration of the drainage at every point between the affected part and the termination of the stream.

The deep cervical lymph nodes collect eventually the lymph of the head and neck, and it is well to trace the nodes as nearly as possible and see that there is no undue enlargement or blockage of lymph. There are many lesions that may cause nodular enlargement, outside of toxins which overtax the nodes.

We will consider next the lymph drainage of the tonsils. We do this before discussing the drainage of the gums because we want to emphasize certain glands and nodes that have a bearing upon the lymph vessels.

The drainage of the upper part of the trachea is often different in its termination than the lower part. The upper part is drained in common with the thyroid gland region, while the lower trachea is drained in common through the tracheo-bronchial nodes which eventually unite with the broncho-mediastinal trunk that may empty at a different point in the subclavian vein than does the right lymphatic duct, or even the thoracic duct. There may be a blockage of the upper tracheal nodes and yet the lower tracheal nodes may have a free lymph flow into the vein.

Lymphatics of The Tonsils

Under this heading we wish to discuss the general lymphatic drainage of the naso-pharyngeal region. This general discussion will include the various lymph glands and adenoid tissues. We will leave the applied anatomy of the eye, ear, nose and throat to those who have written upon that subject. Our intention is to call the student's attention to

the drainage, in a general way, of an area so closely studded with lymphoid tissue.

It will be necessary to include drainage points and receiving nodes that exist in the region of the mandible. In this general drainage we will note the possibility of interference in several places where muscles may, through undue tension, block the lymph flow. We will also refer to the location of the salivary glands and show that the effect of enlargement may interfere with the drainage of the lymph flowing from points above.

If all of the lymph vessels and nodes of the tonsillar region could be shown along with all receiving and collecting nodes, also efferent lymph vessels, we would observe that rings within rings of lymph vessels, including nodes, would complete the circles. One circle would not include these vessels and nodes, as described by some authors. Three or more distinct rings may be noticed.

The first would include the palatine tonsils, the lingual nodes, and lymph vessels. Outside of this ring a second would include the pharyngeal tonsil, the Eustachian tonsils, retropharyngeal glands, styloid, and lateral pharyngeal glands.

The third ring would include the nodes found on the sternohyoid muscle and at the termination of the common carotid artery; also a node or two on sternomastoid. In front under the mandible, the submaxillary and submental nodes, and finally the hyoid nodes.

These three circles will make clear the lymphatic drainage of a region so rich in lymphoid tissue.

First, we will show the drainage of the inner ring. The tonsils are drained by lymph vessels that pierce the walls of the pharynx on their lateral surfaces and end in glands by the walls of the internal jugular veins.

The arches, adjacent to the palatine tonsils, are also drained by these vessels. The nodes receiving drainage of the tonsils and arches lie on the jugular vein near the lower border of the digastric muscle. Free drainage of lymph in the region of the tonsils and the glosso-palatine and pharyngo-palatine arches may be blocked by traction of the muscles in this region. The nerves supplying the muscles may, through lesions, be contractured, or congestion of adjacent parts may cause undue stress upon the tissues. The digastric muscle may have disturbed innervation and cause the muscle to draw upon the lymph vessels leading to the nodes on the jugular vein. The styloglossus also, if contracted, may interfere with drainage of lymph from the tonsillar area.

The vascular arrangement of the tonsils is unusual, as four arteries at least supply each gland. However, all of these arteries are branches of one main artery, the external carotid.

It is the venous and lymph drainage of the tonsils that interests us most. If the veins are compressed through congestion, scar tissue, or muscle contraction over or around them, we are more apt to find a retarded flow of lymph. Enlarged nodes at a lower point will back up the lymph and cause a disturbance in the tonsils and adjacent tissues. Again we see the need of a clear lymphatic drainage all the way down to the terminals in the subclavian veins.

In tonsillitis the lymph nodes enlarge almost immediately and can be palpated readily near the angle of the mandible. If unduly blocked for a period of time, other nodes enlarge and there is a general edematous condition of the tissues under the ramus. It does not take long to block lymph nodes and vessels and unless they are cleared the nodes in adjacent regions show enlargement. First of all, in tonsillar infection, we must start at the supraclavicular area and establish free lymph flow, then work to clear the nodes above that point. Every muscle should be relaxed through the points of innervation. That is, the correction of lesions that will allow free impulses to the muscles. The lymph stream is readily checked in many ways. The lymph vessels are pliable and readily compressible.

Indurated nodes are often found that have been blocked so long through lack of treatment that would have cleared them when they were pliable. Often enlarged nodes in children following colds or some infectious disease are allowed to remain congested and finally become indurated. In these cases, the lymph must follow other vessels that partially lessen the load.

It is well to watch the nodes in children and re-establish good lymph drainage. This may save secondary infection at a later date. It is comparatively easy to regulate the lymph stream in a child if taken when the vessels and nodes are first blocked.

The most common source of bronchial and lung infection is through the throat; very seldom do we find a tubercular condition that has started from any source but by way of the throat. The blockage of the cervical lymphatic glands will cause enlargement of the bronchial glands and then it is but a simple matter for the nodes at the roots of the lungs to become involved. Infection passes downward readily, unless the lymph vessels and nodes are cleared and properly drained, into the lymph ducts and then the subclavian veins. The lingual drainage has been discussed earlier in this chapter.

We thus see that the inner circle collects the lymph and passes it through nodes that are connected with the cervical chain.

The second ring includes a greater area. The retropharyngeal nodes are separated from the atlas by the major rectus capitis muscle.

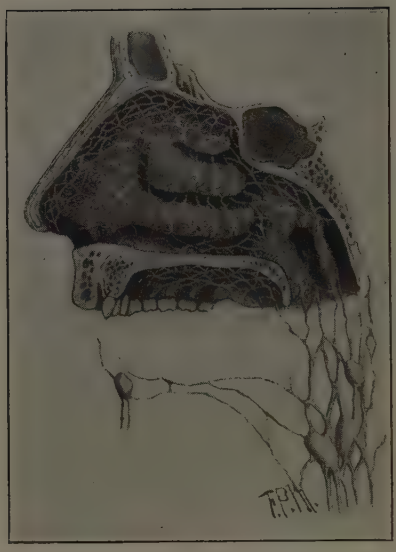

PLATE V.

Lymphatic drainage vessels from the naso-pharyngeal and tonsillar regions.

This is just back of the upper portion of the pharynx. The nodes through their efferents drain into the cervical nodes that lie near the main vessels of the neck.

We have mentioned the retropharyngeal nodes first in this second ring because the collecting lymph vessels are numerous, and include several lymph areas, as the Eustachian nodes, and nasopharyngeal region, and the fossae of the nose. Before the lymph reaches the deep cervical nodes a number of the channels pass through the subparotid nodes. The soft palate is also drained through the retropharyngeal nodes. The drainage of this second ring may be interfered with in several ways. The location of the retropharyngeal nodes is such that faulty innervation of the rectus muscle may disturb the free lymph flow. An atlas lesion may alter the drainage directly or through a disturbance of the tissues from stress or through tissue congestion. These nodes are very important lymph structures and lie in a position that makes possible their enlargement or induration through various lesions of the cervical vertebrae, or hyoid lesions that cause traction upon the muscles or laryngeal and tracheal areas. Vasomotor disturbances to these parts may cause an alteration in the tissues covering the nodes. The subparotid nodes that receive part of the drainage may be disturbed through pressure of an enlarged parotid.

The receiving cervical nodes may already be overburdened with lymph and a backing up of the lymph stream may result in enlargement of the retropharyngeal nodes and a tissue congestion or even hyperplasia result. Cervical muscular contraction, through colds, may produce venous stasis and cause a general blockage in the lymph channels.

Lower cervical lesions and even upper thoracic may interfere with drainage at the terminals which will be reflected in the pharyngeal tissues.

The third ring and outer one, while more superficial, has a significance in that a vast area is drained.

The nodes on the sternohyoid muscle are connected with those of the cervical group chain, also those found on the sternomastoid. This ring includes the submental, submaxillary and hyoid region nodes already referred to. The many lesions that may cause interference with these nodes are readily understood when we notice the areas drained by these lymph tissues and vessels.

A subluxated hyoid may cause considerable traction and, on careful palpation, the nodes on one side may be found to be enlarged. The deep cervical may block the more superficial nodes. The mastoid and occipital nodes may be enlarged through the lower interference. It is

PLATE VI.

Lymphatics of the mastoid, occipital and cervical regions.

well to go over all the nodes palpable, and try and determine the relation between the enlarged nodes and the congested areas found upon examination of the nose and throat.

The nodes in the three rings are bound to be enlarged more or less when there is pharyngitis, tonsillitis, or Eustachian closure. The nodes will not reduce in size to any appreciable extent until tissue congestion is relieved.

We have outlined in a general way the main nodes in these regions. The chapters by specialists on eye, ear, nose, and throat will include more detailed statements.

The main point we have tried to emphasize in the lymph drainage of the head is the attention that must be paid to the terminals of the ducts that empty into the subclavian veins. In many cases the fullness of the tissues above the clavicles will be noticed, and that the left supraclavicular area is more likely to become edematous than the right. This fullness must be reduced before we can expect to drain the head lymph vessels. Stasis in the veins will only aggravate the lymph vessels and cause additional blockage in their channels. Vasomotor control of all vessels in the neck and throat will, when regulated, make lymph flow more normal. Indurated nodes may block the lymph stream until collateral circulation is established.

It is unwise to work directly over enlarged lymph nodes. It is far better to regulate the blood vessel flow and work to the end of freeing the lymph stream through reducing the general tissue congestion.

Lymphatics of the Teeth and Gums

In discussing this section of the head we might say that texts attach too little significance to the lymph vessels found in the alveolar region. Histologists are prone to pass by the subject of lymph vessels in connection with the teeth and gums, and dental anatomists are equally reticent. Bailey gives credit for Schweitzer's statement that "an arborization of small lymph vessels in the pulp of the crown, converging to a few larger lymph vessels in the root pulp and accompanying the blood vessels through the foramina of the apex" is observed in histological findings.

Lymph channels in the pulp are minute but they have a bearing upon the drainage system that insures, when cleared, normal tissue. We are inclined to believe that wherever there are arterioles and capillaries, there are corresponding lymph spaces and capillaries, and that wherever there are capillary veins, there are lymph drainage spaces or channels. The lymphatic drainage system is so complete in the various organs

and tissues of the body that we have come to depend upon our treatment of this system to clear any possible congested or disturbed tissue condition. The pulp of a tooth is the life of it, and drainage is always equally important to supply. The gums are well supplied by plexuses of capillaries.

On the inner surface of the gums from the mucous membrane the collecting ducts have their beginning. From this point they pass between the teeth to a duct that collects the lymph. The arrangement is of a semicircular plan and lies on the outer surface.

The submental nodes receive the lymph from the front lower gums. The submaxillary nodes collect from the back gums both upper and lower. The buccinator nodes sometimes collect a part of the lymph; also the superior deep cervical glands. The lymph vessels of the teeth follow practically the same course. The upper deep cervical nodes eventually collect the lymph.

The blockage of lymph in the gums and possibly in the pulp marks the beginning of abscesses and pyorrhoea. Perfect blood supply and venous and lymph drainage will prevent decay, providing tartar is kept cleared and food particles removed from between the teeth.

The gums in order to have tone and remain pinkish in color must have proper blood supply and free drainage. Systemic disorders and anemic conditions affect the teeth and we can hardly expect to establish a local tone when a systemic absence of tone exists. Much can be done, however, in keeping the gums healthy if we watch the lymph drainage. The blocking of the submental or submaxillary nodes will shortly cause a disturbance in the gums. Any lesion that will contract the hyoid muscles or laryngeal tissues may interfere with the lymph flow from the gums.

The vasomotors to the blood vessels supplying the teeth and gums may be affected by cervical lesions. The veins and lymph vessels will be affected by muscle contraction causing blockage of nodes in the deep cervical group of glands. The presence of goitre may affect the gums and teeth through a checking of the venous and lymph vessel flow.

Subluxations of the mandible or hyoid will cause, in some instances, enlargement of the salivary glands and block lymph flow. The muscles attached to the mandible are often contracted through lesions and this will interfere with drainage.

In order to have perfect circulation in the teeth and gums, we must not only keep them cleansed, but see that no interference with the supply and drainage exists. Too little stress has been laid upon the lymph drainage of the gums and teeth.

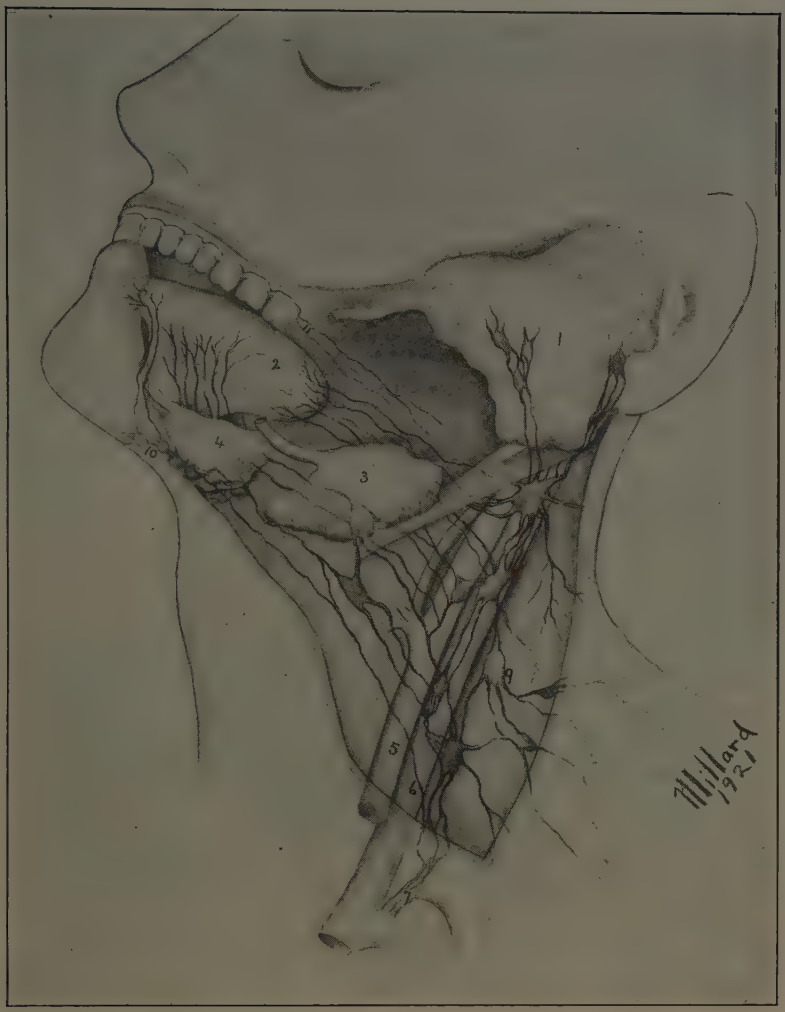

PLATE VII. Nodes in Relation to Salivary Glands.—(1) Parotid gland. (2) Tongue. (3) Submaxillary gland and lymph node. (4) Sublingual gland and nodes adjacent. (5) Carotid artery. (6) Internal jugular. (7) Thoracic duct. (8) Node receiving lymph from the tongue and parotid region. (9) Deep cervical nodes. (10) Submental node. (11) Lymph drainage from gums.

The presence of enlarged nodes in the submental and submaxillary gland region will always indicate a blockage in the lymph vessels that should clear the alveolar areas. We have shown in discussing the tongue the necessity of considering the drainage of that organ in order to have a free drainage for the teeth and gums. The lymph vessels follow a course quite parallel in many respects to those from the alveolar region. The blockage of lymph vessels and nodes in one instance will affect the flow in the other.

Pyorrhea
Lymphatically Considered

Until recently we suspected unbrushed teeth to be a factor in the cause of pyorrhea. Food particles remaining between the teeth were supposed to cause, or set up, a fermentation that resulted in pyorrhea. On second thought we have changed our minds, because the very people who do not take particular pains with cleansing their teeth oftimes have good teeth. Before tooth brushes were a common toilet article, pyorrhea was not known to exist in the same degree as at the present time.

Now-a-days pyorrhea starts with some people by the time they are in their twenties, and sometimes earlier, and at forty dentists find it uncommon not to detect some degree of this trouble.

We have labored long to find the cause of pyorrhea, and have recently satisfied ourselves that the cause is clear to those who will go into the subject thoroughly.

It is not a germ disease; decidedly, no. It is not necessarily a result of unbrushed teeth conditions, but it is a result of an acrid formation beginning at the extreme root ends of the teeth in the way of tiny abscesses with a granular pus collection. These small abscesses are beyond the reach of the probe, and the root canal leading to a closed cavity in the crown of the teeth prevents this acrid pus-like formation from passing up into the pulp in any appreciable quantity. Instead of following the vessels into the pulp, the acrid accumulation gradually works its way up between the gums and the roots of the teeth and loosens the gums from the teeth. This acrid fluid substance affects the gums to the extent of causing them to recede and the peculiar odor and color of the gums verify the statement that the pyorrhea collection of acrid pus is destroying the gums and causing an alveolar disturbance that leads to but one thing: extraction.

Now, we will go back to the primary cause of pyorrhea and lead up to the accumulation referred to above. The beginning is a combination of liver and kidney trouble, and back of this disturbed organic con-

dition is a faulty circulation and innervation of these organs. The chemical changes in the lymph stream and nodes due to altered function of the liver and kidneys reflect themselves in time upon the salivary glands and adjacent lymph nodes. It resembles a mild uraemic poisoning. The altered salivary secretion, the lymph node enlargement and changed lymph substance, both combine to produce in the vessels and lymph spaces around and to the teeth, a substance acrid in nature. Through liver and kidney alterations in function and secretions, a deposit of toxic products causes destruction of tissue at the extreme points of the teeth roots resulting in tiny abscesses. This may be unlike an alveolar abscess in that the changed lymph substance combined with the salivary gland secretion may be more acrid and of a more destructive nature. When this acrid pus formation starts to eat its way toward the free gum surface there is an odor given off which is not hard to recognize. The lymph vessels between the teeth convey this eating fluid to adjacent teeth roots and soon three or more roots are involved. There are certain fluids the specialists use to counteract this pyorrhea condition, but it is difficult to reach because the tip end of the roots contain the first trace of acrid pus. The lymph nodes in any case of pyorrhea are invariably affected. The poisons are retained and tissues are being eaten away. The salivary glands no longer secrete a normal substance, as there is lymph blockage and accumulated poisons in the way of toxic products from a systemic disturbance caused by an altered organic change in the liver and kidneys.

Thus we find the cure of pyorrhea is one of prevention. The liver must be kept functioning normally and the kidneys performing a normal secretion of fluid. Lesions that cause a lack of regularity in the blood supply to the kidneys and liver, or lesions that cause lack of nerve tone or vasomotor control will be the primary cause of pyorrhea.

We are living in a different age and under different circumstances than did the people of a generation or two ago. We have "nerves" nowa-days, and we have changed secretions in the various organs. The influenza epidemic is an example of what excitement and peculiar weather conditions may bring upon a people who live constantly on high tension.

No organ can function normally when the mind is constantly agitated, and excitement prevails. The cause of an increase in pyorrhea is due then not only to lesions of an osseous nature, but lesions of a mental nature as well. We consume in our nervous state chocolates and finely ground food stuffs, and we wonder why our teeth go bad. We go along with a slight blood pressure or a mild nephritis and still expect that a systemic disturbance will not reflect itself upon some weakened tissue.

Changed chemistry in the lymph vessels and nodes along with altered secretions of the glands in various regions will result in pyorrhea as well as weak eyes, and general symptoms that are always associated with these altered states of the body mechanism.

In this connection we might add that the gastric disorders found in connection with the diseased teeth is but a secondary poisoning through salivary secretions being carried downward from the mouth in swallowing. If the pyorrhea is advanced, the additional exudate from between the gums and roots of teeth will mix with the salivary secretion, and result in gastric disorders.

We never find pyorrhea affecting the teeth and gums alone. There is always an additional poisoning of the various weakened areas of the body by the lymph stream that is overladen with toxic substances from deranged organs.

In some cases the whole system is affected; joints, muscles, and various tissues.

The peculiar localization of pus at the roots of the teeth is due to the combination of lymph and salivary fluid concentrating upon a fairly closed cavity that is more or less liable to the collection of saliva and to tartar formations. There is no other proposition in the human body quite like that of the alveolar sockets. The peculiar pressure upon the teeth in trituration and in nervous troubles where there is a "grinding of the teeth," make the sockets containing the roots of the teeth liable to irritation if there is not a normal lymph and blood supply. As soon as there is an alteration in the blood or lymph the tendency of the gum to cleave is made manifest, and then the combined altered saliva, along with food particles, and the altered lymph make the changes that produce the tiny abscesses, and the eating away of the gums that eventually recede. It is an acrid proposition resulting from an altered lymph flow that has concentrated upon these all-but-hidden sockets or pockets.

CHAPTER THREE

APPLIED ANATOMY OF LYMPHATICS OF THE HEAD AND NECK

IN RELATION TO ACUTE POLIOMYELITIS

We have already mentioned that the most direct area of infection in infantile paralysis is through the membranes of the nose and throat. The virus gains entrance during respiration and deglutition.

We have also referred to the mode of infection through the alimentary tract. The virus is carried along with the bolus of food and enters the stomach. During the process of digestion it is conveyed to the intestinal tract and the system takes up the virus and its poisons by way of the lacteals and blood channels.

A more direct infection of the central nervous system may take place through the lymphatics of the head and neck. The membranes of the nose, nasopharyngeal region and mouth are rich in lymphoid tissue. The close connection between the lymphatic tissues of these areas and those found in the head and neck allow a conveyance of the virus to the membranes of the brain and spinal cord. The openings for communication are numerous and the paths for the conveyance of infection are closely connected. The superficial and deep lymphatic vessels and nodes found in the neck and throat allow of ready communication and transmission of the micro-organisms and their toxic products. The central nervous system may be almost directly invaded by the virus found in the membranes and lymphatics of the nasopharyngeal region. Once the virus reaches membranes protecting the central nervous system the upward invasion to the brain from the cervical region is readily accomplished.

The cerebro-spinal fluid surrounding the cord also supplies the area around the brain. There is a communication between the cord and brain, as the same coverings that surround the cord are continuous with those covering the brain.

One of the most noticeable symptoms in an acute case of infantile paralysis is headache. There is also pain in the neck. The temperature increases in a typical case until it reaches 103° or more. The congestion in the head and neck is marked. The neck seems swollen; the lymph nodes are enlarged and indurated. The lymphatics are involved as well as the blood vessels. The lymphatics have carried the virus to the hidden membranes of the central nervous system.

PLATE VIII. Vascularization of the central nervous system from which the lymph spaces receive their supply.

The invasion may have taken the route found in the cervical region, the cephalic membranes first becoming infected. The virus in this case must needs travel downward in the central nervous system if the case is one that is not abortive in type. General infection of the cord may or may not take place. The cephalic membrane involvement may be sufficient to cause a bulbar paralysis which will eventually affect all points below and prove fatal in nature if sufficient destruction takes place. Again, it is the amount of resistance the tissues have that will determine the extent of the destruction in the nerve cells. The lymphatic engorgement will depend upon the lack of freedom of circulation and the quality of the blood and lymph.

The nodules will indurate in proportion to the amount of blockage. The more regular the circulation the better the oxygenation of the blood will be, and good blood, well aerated, is the best of germicides. The microorganisms lose their power in proportion to the vitality of the tissues they have to work in.

The extreme amount of congestion in the head and neck is due in part not to the virulence of the virus as much as to the amount of obstruction found in relation to the blood vessels and lymph channels.

The nodal induration is much more rapid when the blood circulation is impeded. The feverish condition of the head and the tendency for the head to draw backward is not so much a question of the effects of the virus and its toxins as it is the effect upon the nerve centres through congestion by obstructed blood and lymph channels.

The involvement of the lymphatics is due in the first place to the more ready infection and conveyance of the virus by the fact that the tissues in which these vessels are found were devitalized by obstructed or impeded circulation.

The normal tissues in the pharyngeal and nasal regions of a child will not harbor nor convey to the same extent the virus as in the case of a child in which adenoid growths and diseased tonsils are found. The child with polypi and congested turbinate processes will likewise harbor germs and propagate them in a soil that is suitable for germ development through obstructed lymph and blood channels.

The cause of this static condition in the sinuses of the head and the membranes lining these as well as lining the pharyngeal region may be due to a variety of lesions. There is always a possibility of hereditary weakening or diathesis with nervous instability, but we will discuss here the part the osseous lesions play in the role of primary causative factors.

The drainage of the lymphatics of the head and neck is quite the same on both sides. Below the neck and for the rest of the body we

PLATE IX. The lymph spaces found in the membranes of the cord are numerous. Right lateral view of cord and the formation of spinal nerves. The lymph bathing the cord and spinal nerves is found in abundance.—(1) Anterior horn. (2) Posterior horn. (3) Anterior median fissure. (4) Posterior spinal nerve roots. (5) Ligamentum denticulatum. (6 & 8) Dura mater. (7) Posterior ganglion.

find a vastly different proposition. The lymphatics of both sides of the head and neck tend to pass downward to a common collecting centre, the subclavian veins. The superficial communicate with the deep, and the lymphatics of one side communicate in some instances with those of the opposite side. Normally the nodes are not over-sensitive unless pressed upon. Induration is pathological if found to any extent. The same rule that governs the freedom of circulation of blood is more or less applicable to that of the lymph channels. Lesions that contract muscular tissue will obstruct lymph channels the same as they will obstruct the blood vessels. Not all lymphatics have vasomotors supplying them, it is true, but there are other ways of obstructing the flow of lymph and blood than through the vasomotor nerves. The lesions mentioned under the heading of "Cervical" in the preceding chapter are applicable to lymph channels as well as to the blood vessels. The lesions that produce a congested condition of the tonsils will invariably affect the lymphatics that are so abundant in this region. The lymphatic tissues that form the outer and inner defences of the naso-pharyngeal region suffer obstruction and nodular enlargement whenever there is venous stasis.

The involvement of the membranes of the sinuses of the head are either secondarily or simultaneously affected through a vascular disturbance in the vault of the pharynx and the region of the nose.

The congestion in the membranes protecting the central nervous system are the effects of lymph and blood vessel obstruction through a lesion of some nature—osseous or otherwise. Before congestion there must be obstruction, and before invasion and toxic poisoning from virus there must be a suitable soil or else the tissues would produce an abortive condition.

Thus we see first, last and always the greatest preventative measure in infection of any nature will be the maintenance of normal circulation both in the lymph channels and in the blood vessels. This accounts for the numerous cases of the abortive type of infantile paralysis, and also the noted fact that in many instances only one or possibly two in a family of several children contract the contagion; the others not becoming infected.

Fortunately, the microorganism of infantile paralysis does not attack children as numerically as the germs that are connected with some of the other and more common diseases. In scarlet fever, measles, whooping cough, etc., there seems to be a condition that makes the contagion spread with a more decided virulence. It is not uncommon to see these children's diseases go right through the family.

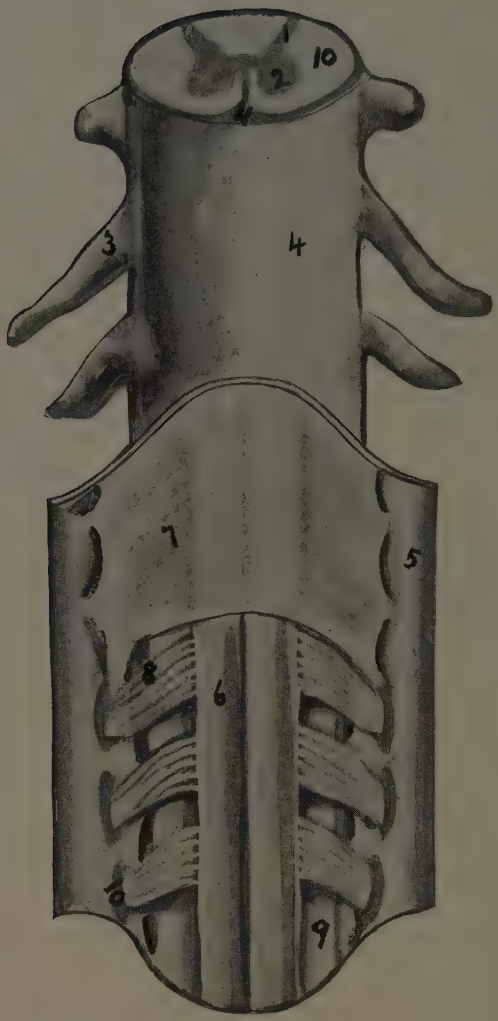

PLATE X. Anterior view of the cord and membranes. The lymph bathes all these cells and tissues. (1) Posterior horn. (2) Anterior horn. (3) Spinal nerve with covering. (4) Dura mater. (5) Turned back. (6) Spinal cord bared. (7) Arachnoid. (8) Anterior nerve roots. (9, 10) (Top number) Lateral surface of cord. (10) Anterior nerve passing through dura mater.

In infantile paralysis the central nervous system is directly involved, and the child who, due to lowered tissue resistance from spinal lesions and other conditions, furnishes the most suitable tissue soil, is the one that will be the victim. The others may have the germs in their mucous membranes, but the soil is not favorable to infection and they will have simply an abortive type or will not be affected in the least.

The obstruction of the lymphatics may be due to a secondary condition. The presence of stasis in the region of the tonsils may be somewhat chronic in nature. There may be repeated attacks of tonsillitis which may last only a day or two. The disturbance may be almost wholly vascular. Should the obstruction persist and the lymph nodes become enlarged there will be a lymphatic involvement that will tend to complicate matters. Infection will be a natural sequence. The correction of an atlas or axis lesion that will remove any disturbance to the superior cervical ganglion with its postganglionic fibres that control the vasomotors to that region where stasis has been present will re-establish normal lymph flow.

Lymphatic involvement may be secondary to a vasomotor disturbance to the blood vessels in the same region where congestion exists. The hyoid bone slightly misplaced will put tension upon one set of the muscles attached to it and cause not only venous stasis but a blocking of the lymph channels, and as a result we will note nodular enlargement in the lymphatic chains. The enlargement of the nodes in the region of the mastoid may be due to an obstruction of the lymphatic channels in the region of the clavicle. The backward luxation of the clavicle with a subluxated first rib may obstruct the drainage of the lymph into the subclavian veins.

The middle cervical ganglion may be involved and we may have a thyroid disturbance as well as cardiac irregularity through a cervical lesion. This may in turn cause pressure by thyroid enlargement upon the lymph channels and produce toxic poisoning of the membranes and tissues in the throat, head and central nervous system.

The presence of an aneurysm may, through mechanical pressure, cause a greater disturbance than any single osseous lesion. A cervical rib may cause irritation of the brachial plexus and the sympathetic system that will not be relieved until surgical measures are used. Not all disturbances are from osseous lesions in the way of vertebral rotations or subluxations, and not all disturbances are from local interferences. The lymph channels may be affected and infected through disorders in the axillary and mammary region, or even lower down. There is a communication between the lymph channels of the thorax and cervical

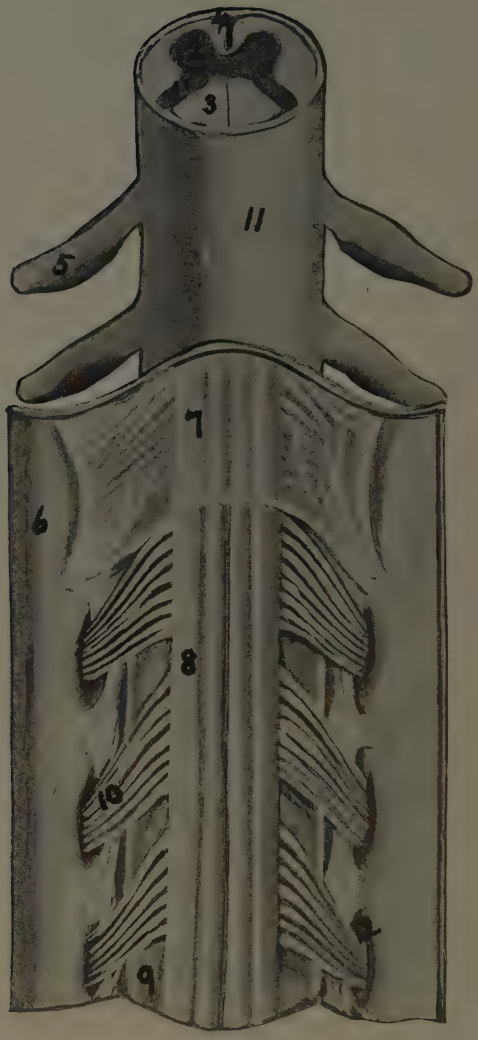

PLATE XI. Posterior view of spinal cord. The lymph blocked in acute poliomyelitis prevents the nerve and cord cells from functioning properly.

region back of the clavicles. That is why no diagnosis is complete that does not include a complete systemic survey in each instance. The high temperature of a child or an adult may be lowered by a single adjustment in the upper thoracic, or a similar effect may be brought about through the correction of a cervical lesion. The idea is to determine the exciting cause, if from a lesion, and correct the irregularity if it is at all possible to do so.

Lymphatics of the Thorax and Abdomen

Infection almost invariably complicates the lymphatic system. We are prone to think only of the veins conveying impure blood and producing congestion and stasis, but we must remember always that the lymph channels are the conveyors of toxic products, and blockage in a node or number of nodes will affect the elimination or retard the dissemination of toxic products.

There is a possibility of the virus found in infantile paralysis cases entering through the bronchial tubes and infecting the tissues in relation to the roots of the lungs. Dust particles include germs, and their entrance via the bronchioles may cause infection and enlargement of the lymph nodes in that area.

There is a possibility of the virus or microorganisms of infantile paralysis lodging and becoming scattered through the lymphatics in the thoracic region in relation to the bronchial terminations.

Around the cord the pia mater and arachnoid harbor lymph spaces. These spaces are in communication with the vessels, and it is through them infection enters the cord substance.

In the abdomen below the diaphragm the cisterni chyli is located. Into this receptum the intestinal lymphatic drainage enters and the beginning of the thoracic duct is found. This duct collects from the abdominal viscera and passes through the diaphragm in relation to the aorta.

The lacteals carry away some of the chyle absorbed from the small intestines and convey the substance to the thoracic duct that passes upwards to empty into the subclavian vein on the left side.

The peritoneum is a lymphatic sac in one respect. The amount of absorption that takes place in the peritoneum is great.

The food taken into the stomach containing the microorganisms of infantile paralysis are readily absorbed by the lymph channels and conveyed to the blood circulation.

The possibilities of mixed infection is worthy of consideration. If a lymph channel is already infected by other germs, it is in no condition to combat the virus of infantile paralysis should it be absorbed.

PLATE XII. Vascularization of a section of the spinal cord, showing the three spinal arteries and correlating spinal branches from the intercostal. The cerebro-spinal fluid is of a lymph formation, and the area is bathed by this fluid also.

The lymphatic system is in danger of blockage and sluggishness the same as the vascular system. The normality of the nodes and channels of the lymphatic system will depend to a great extent upon the condition of the blood vessels and the tone of their walls. If we find stasis in the mesenteric blood vessels we are likely to find nodular enlargement of the lymphatic system. The numerous nodes found in the mesentery and along the vessels of the bowels are normal only so long as the blood stream to and from the abdominal viscera is normal. A diseased organ is one that has a disturbed circulation regardless of the cause. If an organ is functioning abnormally we invariably find its vascular supply disturbed. If an organ is mechanically interfered with we also find the circulation to that organ affected. The cause being removed, the circulation may once more be re-established.

The infection of an organ is through its vascular channels, either the blood or the lymph. The better the circulation the less chance of germ invasion. The more perfect the assimilative mechanism the less liable the virus to be disseminated and propagated.

Lymph spaces are found around the cord in all regions. The vascularization of the cord is complete at every segment. The entrance of germs at any point is possible. The normality of the lymph spaces in relation to the pia mater will depend to a great extent upon the normality of the vascular system in relation to the cord and its membranes.

If there exist lesions at any point along the length of the cord we at once find a lowered tissue resistance to that area of the cord.

There may be a trophic disturbance or a vasomotor instability to the vessel walls, or we may find stasis from a contractured musculature that will block the lymph spaces. In any of these conditions the tissue vitality will be undermined and invasion is more apt to take place.

In the thoracic region we may find costal lesions as well as vertebral. The relation of the intercostal vessels to the ribs may, in a costal subluxation, so disturb the sympathetic ganglia that the tissues around the foramina will become irritated, and this will extend into the cord through the blood channels.

The blockage of one vessel to the cord and membranes may so lower the nerve and cell integrity that a cord segment will become readily infected by the virus.

Remember that the cord segments and their cells must be kept at a certain tone from a vascular standpoint or else the cells will not function normally. In the ventral portion of the grey matter of the cord the motor cells send forth their efferent impulses, and the muscular tone of the limbs will depend upon the normality of these im-

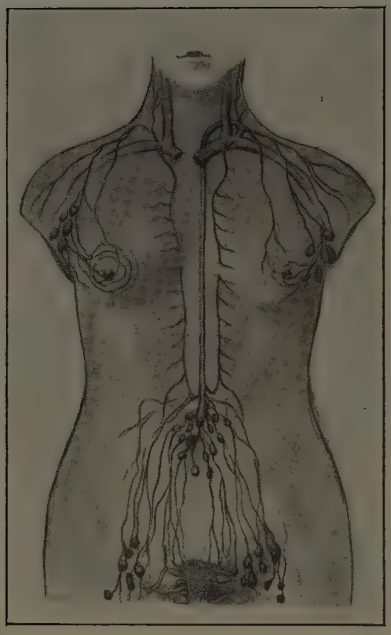

PLATE XIII.
General Scheme of Lymphatics.

pulses for their strength and motion. The lowered tone through disturbed vascularization, plus the invasion of the virus or its toxins, even in a mild or abortive case, will cause a disturbance to the efferent tracts in proportion to the degree in which the cells resist the attack.

In the more severe cases of infantile paralysis, where exudation accompanies congestion, we note a marked destruction of the motor area.

If the spinal arteries and veins are obstructed to any extent the lymph spaces are occluded, and nature's effort to clear the condition is sorely handicapped. Thus we see the prime importance of keeping a child's spinal tissues up to normal so that should the virus gain entrance to the body there will not be lowered tissue resistance in the region of the central nervous system.

The region of the diaphragm, with its many openings for the passing of nerves, vessels, tubes, etc., is of interest. The presence of lower rib lesions or vertebral misplacements may so affect the attachments of the diaphragm and its crura that the openings found in its central tendon and in the region in relation to the vertebral column may cause undue pressure or obstruction to these various tubes, vessels and nerves.

The veins and thoracic duct are passing upward; the nerves, aorta and esophagus are going downward. All have their functions and any minor obstruction may cause a systemic disturbance.

The thoracic duct has a few valves to prevent backward flow. It is a long tube, and gravity is against it the same as in the saphenous veins. This duct has its vascular supply and nerve tone, although it has not the marked muscular tissue within its walls that is found in the blood vessel walls. The thoracic duct is a great collecting system and the flow of lymph must be emptied into the veins as regularly as possible.

From the fact that the lymphatic system has to deal with toxic products, we must at all times determine the condition of this duct and see that no lesion exists that will in any way affect its walls or its conveying properties.

The cisterni chyli is located in front of the second and third lumbar vertebrae. Lesions that are found at this region, or even higher, including lower costal, may have a marked effect upon the receptive properties of this collecting system.

The drainage of the mesenteric nodes into this cistern will depend upon the normality of the blood vessel circulation. The presence of obstipation, with poor peristaltic action, the finding of adhesions or the noting of growths and thickening of the tissues, all have a bearing upon the lymphatic system. Splanchnoptosic conditions will affect drainage

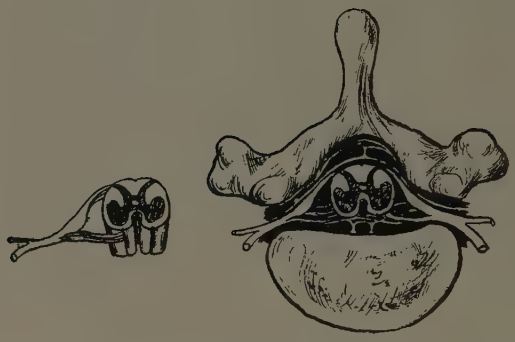

PLATE XIV.—Section of the spine. A vertebra with the spinal cord and its membranes. The small cut to the left is an enlarged section of the cord. Lymph spaces are found in this area.

and obstruct the lymph channels. This will lower the general tone of the tissues. In children colic, convulsions and constipation will lower the vitality.

The tissues of the entire body in the child are not only growing, but must be sustained in the way of complete nourishment as well. In the adult the growth is complete and sustenance alone is required. The activity of a child is much greater than in the adult, as a rule. The resiliency of the tissues is greater, and the bones are not as yet completely ossified. He takes up shock better than an adult, and the nerves do not seem to suffer from accidents as do those of the adult.

The common point of tissue irritability is when we find a lesion from a fall or strain. The disturbance to the vessels and nerves, unless the proper adjustment is made, will continue to lower tissue resistance through nerve irritation. If the sympathetic chain is involved through its connection with the spinal nerves, the vasomotors will suffer from impeded circulation, and the impulses will become irregular.

The spine of a child from the time it is born must be inspected if we wish to keep him free from lesions and scoliosis. Some children grow up with almost perfectly aligned spines, while others, through traumatism, suffer irregularities that adjustment alone will rectify.

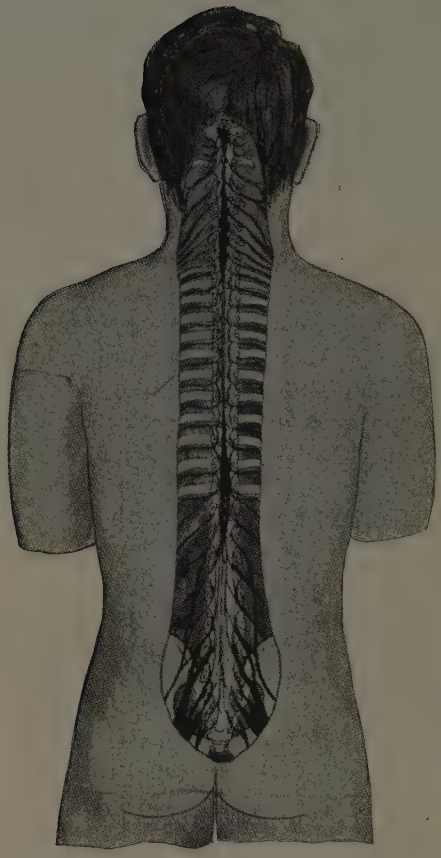

PLATE XV. The spinal cord and nerves exposed. The lymph bathes the entire tract.

CHAPTER FOUR

LYMPHATICS OF THE THORAX

The Lymphatics of The Lungs and Pleura

The most perplexing part of the lymphatic system to a student is possibly that of the thoracic region. It is easy to understand the thoracic duct and its cluster of tubes at the lower part, the cysterni chyli, but the drainage of the intercostals, the lungs, bronchi, esophagus, heart and diaphragm is difficult to comprehend. There seems to be a lack of plates in most texts on anatomy to furnish object lessons. In a general way a few of the channels are shown, but the student is still at a loss to comprehend just how there may be ducts that convey lymph from these various organs and tubes as the bronchi, esophagus and aorta, and still be independent of the great thoracic duct.

Let us open this discussion by saying that the lymph must eventually reach the subclavian veins, or possibly the innominate veins. The student is familiar with the fact that the lymph flow to the subclavian veins empties through two main ducts, the right lymphatic, and the thoracic duct. There are other points of entry separate from these two main ducts; sometimes two or three. For instance, the internal mammary ducts usually empty into the subclavian as distinct ducts. The mediastinal may join the mammary or empty separately, but they all enter the veins at some point within a small radius. It may be on the upper surface, the anterior, or even inferior surface of the vein. Now let us take up the drainage of the bronchial nodes first. Around the lower part of the trachea and over the surface of the bronchi the tracheo-bronchial nodes are scattered. At the angle of the bronchi and also where the bronchi divide nodes are present. They even extend to the bronchioles but not into the alveoli.

All of these nodes have efferents and must be drained. The drainage is upward toward and into the subclavian veins. These nodes drain the lung tissue as well as the bronchi and trachea. The lymph from the heart reaches these nodes also in part at least.

The efferents from these nodes join in some instances those of the internal mammary and pass on to the subclavian veins. The right may enter the right lymphatic duct, or may enter the subclavian vein direct. On the left side the thoracic duct may receive the mammary efferents or the subclavian vein receive the drainage directly. The lungs have their superficial and deep plexuses of vessels, but they all drain toward the hilum which receives the lymph flow of the lung tissue.

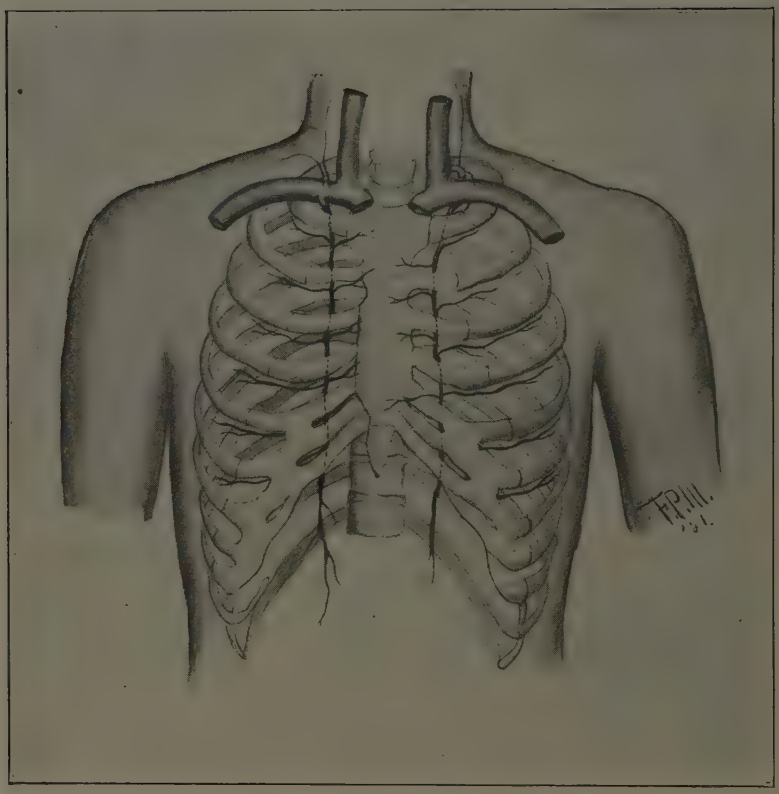

PLATE XVI. The internal mammary lymph chain collects lymph from the anterior intercostal spaces, inner areas of breasts, some from the pleura, and from the upper anterior surface of the liver.

From these nodes the tracheo-bronchial nodes collect and through their efferents eventually empty into the internal mammary or mediastinal nodes to be conveyed to the veins on either side. The superficial and deep lymph vessels in the lungs anastomose only at the hilum, at the root of the lung, on either side. The pleura has a more distinct drainage as the visceral layer drains into the lung afferents on its surface, while the parietal lymph streams are collected according to the regions they are located in. In front they are collected by the internal mammary after passing through the intercostal muscle lymphatics, while the lower parietal lymph vessels may join with the vessels of the diaphragm. In the posterior region the medisatinal nodes collect the lymph from the parietal part of the pleura.

Thus we see how simple the drainage is if we remember the collecting tubes of the different regions.

Dr. Snyder, in his chapter on the lungs, outlines very nicely the drainage of these tissues. In this general discussion we wish only to give an idea of the drainage, so that we may refer to some features of the applied anatomy of the same.

In the first place, we wish to emphasize the importance of free lymph drainage in the nodes that collect and send forward the lymph. We have mentioned in another chapter the fact that lung infection is usually downward from the throat. It is easy for a catarrhal condition to work its way downward, also infection and congestion.

The nodes in children are of a pinkish tint, but in the adult they often become dark or black and enlarged. If these blocked nodes become infected with tubercular germs, suppuration may take place, and the discharge may be thrown into the bronchi. This will infect the lung tissue in time, as only part of the discharge can be coughed up. The breaking down of the nodes is often the result of dust laden particles being conveyed to the bronchial tubes.

Now, we come to the osteopathic idea of keeping these nodes in tone. We cannot keep people away from dust and irritating inhalations, but we can keep the pulmonary and bronchial vessels and tissues toned up through our method of adjustment.

The contour of the chest wall may have a lot to do with the condition of the blood and lymph supply within. A flat-chested person has not the chance for resistance that a well rounded chest has. The sagging of the ribs may be due to lack of tone in the muscles, but we find that more often there is either a curvature or one or more lesioned areas.

To correct posture we must first secure spinal alignment. We may have to start at the innominates and work from that basic standpoint.

As we secure normality of the spine, we can elevate the ribs and secure better vasomotor control. Adjustment of the upper thoracic area will add tone to the lung tissue as the circulation will be more regular. Where we secure a good arterial supply we also insure a better venous drainage. We are now reaching the point where we can work to advantage on the lymph stream. We pointed out the various drainage tubes, and it is to the end of securing a better lymph flow that we now work. The nodes are secondary in importance in some respects to the efferent flow of lymph. Unless we have a free drainage we cannot expect to relieve the over-burdened lymph nodes. If it were possible to keep the thorax in normal position, vertebrae, ribs and sternum, we would have little difficulty in regulating the blood supply. The good blood coursing through the vessels and tissues would sustain a tone that would prevent germs from gaining a hold on the nodes. The nodes are usually normal if the blood circulation is perfect or nearly so. You will recall the generous blood supply that most nodes have. It is this supply that keeps the nodes capable of resisting invasion. If we work to the end of regulating blood supply to nourish and drain, vascularly, the nodes, we will find we have accomplished much. The sinuses within the nodes are kept normal mainly through the blood that supplies each node. Here is where we check the points of invasion. A node breaks down because it has lessened resistance through faulty circulation of the blood. Thus we have the proposition of keeping up the tone of the lymph nodes and vessels through vasomotor control of the blood vessels. This point is seldom if ever emphasized, but it holds good in any part of the body where nodes exist.

The entrance of dust, irritants, poisons, germs or foreign substances of any nature into the nodes may be offset to a large degree by the regulation of the blood supply to and from the nodes.

In weak-chested people we must first of all secure alignment, then good posture, and finally good tone through indirect vasomotor control.

The efferents from the pleura include the internal mammary, as we have said. The internal mammary receives part of the intercostal drainage. If there are one or more costal lesions a proportionate blockage will result. If the scaleni muscles are tensed through cervical lesions, and the first and second ribs drawn upward, there is a possibility of interference with lymph drainage from a portion of the lungs and pleura.

The vessels crossing the first ribs may be interfered with and the thoracic duct on left side drawn in a position to check drainage into the vein. The vessels to the bronchial tubes and lungs are controlled through vasomotor centres that may be influenced in the upper thor-

PLATE XVII. Lymph drainage of the larynx, trachea, bronchial tubes and bronchioles.

acic sections. The nerves to the lungs may be influenced by cervical lesions as well as upper thoracic.

Blockage of the lymph stream in the neck or around the trachea may interfere with the lung efferents. The tracheo-bronchial nodes and the mediastinal may be checked in their drainage through congested membranes and tissues. This calls for a better vascular regulation. These two systems work together to clear any area or region. We must work to secure good lymph drainage by not only removing any interference with the efferents from the nodes, but through the reducing of congestion around the nodes and efferents.

The clavicles have much to do with interference with lymph drainage at times. We find a clavicle in some instances not in true alignment, occssionally backward at external end. It is well to see that they are not drawn out of line. There are so many vessels, nerves, tubes, etc., passing through the upper thoracic opening that we need to determine if there is room for these various structures; also, note the presence of congested or thickened areas. The person with a goitre may have a weak-chested condition not only through disturbed nerve impulses, and irregular blood flow, but by lymph blockage as pointed out in the chapter on the thyroid gland.

The broncho-pulmonary nodes are usually over-burdened at their best. It is a question whether any one has normal nodes in this region. Inhalations and catarrhal exudates and infections by tubercular germs, even though practically latent, all contribute to keep the nodules in the region of the hilum in an overtaxed state. The alveoli have no nodes, but the lymph vessels are found in the lung tissue. The correcting of lesions that will insure better respiration will do much to clear the lymph vessels.

Any interference with the intercostal muscles or costovertebral attachments will shorten breathing and correspondingly impair lymph drainage. Very few people breathe properly, and when they contract colds or have a cough they almost immediately assume a faulty posture. This drooping of the chest not only affects the intercostal lymph vessels but retards the flow of lymph in the thoracic duct and mediastinal nodes. The erect posture relieves the pressure and the efferents convey their lymph more readily.

We have not given the lymph flow sufficient thought in the past. We have never realized the full significance of free lymph drainage. The lymphatic system peripherally being a blind end or closed system, so to speak, without any force to start the flow, as in the vascular system, we have felt that it simply cleared itself according to the physiological activities found in various conditions.

The lymphatics start their collecting system in the capillaries and it is only through indirect tone furnished by the tissues and vasomotors that control the vessels that we can expect a normal flow of lymph. Only the numerous valves prevent the lymphatics from becoming thoroughly blocked. At all times work to secure good lymph drainage. By so doing you invariably at the same time secure better vascular regulation.

The lymph stream is the weak member in the circulatory system, and we must study out every method of securing better drainage of lymph in order that the nodes will not become blocked and indurated.

We depend upon the lungs to purify the blood, but we must not forget that there is a separate set of blood vessels that supply the lung tissue, and that these tissues must be drained also by not only the veins but the lymphatics.

Unless we can keep the broncho-pulmonary lymph nodes clear the areation of the blood in the alveoli and lung tissues, will not be sufficient to prevent breaking down of the general system through a checking and final infection in the nodes around the bronchi. The aeration of the blood in the lungs is no more important than the preventing of induration in the nodes that drain the lung tissue.

To have good general circulation and tone throughout the body we must have cleared afferents and efferents in the broncho-pulmonary nodes.

Lymphatics of the Axillary Region

The physician is more familiar with this region, lymphatically considered, than any other except the cervical. It is so common to find enlargement of the axillary nodes in infectious diseases and after vaccination that his attention is called to this area frequently.

The possibility of lymph blockage at this point makes one think of the efferents that lead to the subclavian nodes. These nodes empty by vessels on the right side into the subclavian vein or directly into the right lymphatic duct. Between the subclavian nodes and the terminal drainage point the subclavian trunk passes between the vein and the subclavius muscle, and then behind the clavicle. On the left side the trunk may enter the thoracic duct or empty directly into the subclavian vein at the junction with the jugular. The subclavian muscle may be in a state of tension from a subluxated clavicle or through disturbed innervation of the muscle. These lesions will retard the flow of lymph in the vessels.

When we consider the deep lymph drainage of the axillary region, its drainage of bone, periosteum, ligaments, muscles and other tissues, we get an idea of the relative importance of keeping all muscluar con-

tractures at a minimum. If there are costal lesions they will affect lymph drainage, and if the pectoral muscles are tense, we must expect a similar retardation of lymph flow. The free anastomosis found in the lymph vessels of the arm, as elsewhere, makes the lymph drainage of the axillary region a common one. The central group of nodes in this region collect from a vast area and the point of interest lies in the direction of the terminal drainage point. The supraclavicular and the subclavian nodes are often blocked. Even the lower cervical nodes are involved when the axillary are enlarged. Snow refers to regurgitation in malignant cases leading to retrosternal involvement and secondary infection of the head of the humerus. We find regurgitation possible elsewhere as in the lymph vessels in gastric cancer. This simply proves that although lymph vessels have numerous valves there may be regurgitations under certain conditions. Going back to the lymph drainage of the muscles we may reach and influence the flow of lymph through a better vasomotor control of the blood vessels that supply the tissues and nodes. We may also reach the lymph drainage through correction of lesions that remove muscle tension over and around the lymph vessels and nodes. This will call for adjustment of the cervical region to insure normal tone in the brachial plexus. Correction of upper thoracic and rib lesions will stimulate vasomotor and trophic centres. Costal correction will regulate the upper thorax so that the lymph drainage into the subclavian veins will not be checked. The scaleni may be overtensed through cervical lesions.

Correct posture will help to insure good lymph drainage from the axillary region. The lymph vessels and nodes often are attached to the sheath of the veins. They follow the vessels closely in many instances. This is another reason why we should keep muscle tension at a minimum, as a tensed muscle will interfere with the blood flow and a thickening of the adjacent tissues may block the lymph flow and cause an undue toxic effect that will result in a blocking of certain lymph nodes and vessels. The axillary region is an active one in that the use of the arms cause the muscles of the shoulder and pectoral region to be actively engaged. Normally muscular activity aids lymph flow as well as venous flow. It is when there is axillary adenitis or lymph blockage in the afferents that motion is sometimes disadvantageous to the lymph stream. The mammary area, if blocked, will check the flow in many of the vessels. If there is an additional axillary blockage the retarded mammary lymph flow will cause a pectoral disturbance that will not clear until the axillary and subclavian nodes are reduced. The subclavian may receive mammary lymphatics, also the internal mammary

nodes will take up part of the mammary drainage, but it is through the axillary nodes collecting the pectoral lymph that we must look for drainage when we find tumors forming in the breast. We are called upon almost constantly to reduce these "lumps." If there is no malignant condition we are reasonably sure of reducing them by axillary drainage, unless they are unduly indurated.

The lessening of pectoral muscle tension and correction of costal lesions, as well as cervical and upper thoracic lesions, to insure normal nerve tone, will be the more important. Direct manipulation of the axillary nodes is contraindicated. It is far better to reduce node enlargement through adjustment of lesions as outlined above.

Sometimes a lymph vessel from the mammary gland passes through the substance of the pectoralis major leading to the subclavian nodes. If there is faulty innervation to this muscle the undue contraction may check the lymph flow.

The region of the scapula is drained by efferents into the axillary nodes. We now see what a large area these nodes in the axilla collect from. In cases of scoliosis, where there are group costal lesions, we may find a sufficient blockage to over-burden the nodes of the axilla. If there is a goitre, and the lower cervical nodes are enlarged, we may find an additional pectoral blockage, especially if the lymph vessels of the upper extremity empty into the two large terminal trunks, the right lymphatic and the thoracic. It takes but very little supraclavicular edema to interfere with terminal drainage. The entire arm may be affected. Slight puffiness around the fingers may lead us to suspect lymph blockage either in the axillary or clavicular regions. The small nodes in the cubital fossa, or the epitrochlear nodes may become enlarged if there is interference above.

The establishing of better circulation in the arms by vasomotor tone will assist in clearing up a lymph sluggishness.

The cervical area must be cleared first. The first dorsal nerve must not be overlooked as a branch of that nerve enters in the nerve plexus. The first rib is sometimes slipped sufficiently to cause a lymph disturbance.

Test out the arm movement to be sure that the tendon of the biceps is absolutely in the groove, and that there is a good free arm movement.

Neuritis is so common that we find many mild cases in every day practice. Well marked cases are fairly common also. The lymph flow, if checked, will poison or irritate the nerves as there is a certain amount of lymph fluid within the sheath of the nerve. In fact, I am in-

clined to believe that neuritis and tic are lymphatic disorders. In experimenting with both of these maladies we have found that there is always a lymphatic involvement, and that, upon freeing the lymph flow the symptoms disappear. This statement may be new. I have not seen it discussed elsewhere, but if you will work on lymphatic drainage technique in these two troubles, you will soon find that the lymph flow that has been checked for a period of time has much to do with the unpleasant symptoms that are associated with it.

Secure good venous drainage and then work to the end of reducing the nodes by treatment around the base of the neck.

We will take up intercostal lymph drainage in the next section. The pectoral lymph vessels anastomose with the intercostals at some points, but axillary drainage does not include intercostal drainage to any great extent.

Intercostal Lymphatics

The intercostal area is extensive. The combined length of the intercostal arteries and veins would measure possibly 72 feet. The lymphatic vessels have nodes principally at the sternal and vertebral ends. A few nodes may be found in the intercostal spaces. The posterior nodes of the intercostal lymphatic chain lie near the heads of the ribs and receive the afferents from the intercostal spaces and muscles. The upper five or six nodes have efferents leading to the subclavian veins in the two main ducts. The lower six nodes have efferents leading to the beginning of the thoracic duct near the receptaculum chyli. Thus the drainage of the posterior and lateral sections of the intercostals is partly upward and partly downward, and then upward. The right lymphatic duct receives only the efferents of the upper six intercostals in the posterior region on that side, and the thoracic duct the upper six left at its terminal into the subclavian vein and the lower six, right and left into the beginning of the thoracic duct.

About eighteen intercostal efferents of the posterior thoracic region enter the thoracic duct at some point and only six the right lymphatic duct.

The anterior intercostal drainage lymph vessels are in relation to the internal mammary blood vessels. The internal mammary nodes collect and carry lymph by efferents to the subclavian veins. They collect from the thorax, mammary gland, upper surface of the liver, the diaphragm, internal intercostal muscles, and subpleural tissue.

So we have two systems of drainage of lymph in the intercostal region, and two chains of nodes, one on front of ribs near costovertebral

union, and one behind sternal end of ribs in relation to internal mammary blood vessels. The two chains on either side of the sternum in the anterior region have efferents from their nodes to the subclavian veins. Each side draining into the vein on each side as compared with the posterior lymph drainage of three fourths into thoracic duct and one fourth in right lymphatic duct.

The nodes found behind the sternum at the lowest point collect from the diaphragm and the upper surface of the liver and pleural surface in that area. It is through the anastomoses of these two anterior chains and their collection from the outer mammary region that infection may cross from one side to the other in malignant breast cases. It is also through the lower collection of lymph back of the ribs in the sternal end that diseases of the lungs and liver may be conveyed from one organ to another. The lymph vessels from the parietal pleura enter these nodes. The many lesions that may interfere with intercostal lymph drainage hinge principally on the lack of normality of the spine. Single or group lesions of the ribs will interfere with lymph drainage. The first rib may cause more disturbance than any other, as it is in relation to the subclavian vessels and these veins receive the terminal drainage of all the lymph.

So, we will start at the top; first, we will detect any subluxation through scaleni tension or through costovertebral tension. Next the upper thoracic vertebrae to determine existing lesions, three vertebrae usually, at least. A single vertebra is seldom in lesion without disturbing the one above and the one below. The intercostal nodes near heads of ribs may be enlarged through the state of the tissues supplied by the intercostal blood vessels, through lesioned ribs, or vertebrae. These nodes are usually independent of communication with the mediastinal nodes and vessels. They simply drain the lymph from the intercostal spaces and convey it to the subclavian veins. The internal mammary nodes receive the lymph vessels of the pleura in that region and connect with lymph vessels of the diaphragm and the upper surface of the liver. These last nodes and efferents may eventually join the tracheobronchial and anterior mediastinal to form the bronchomediastinal that empty into the subclavian vein directly, or into the large ducts on either side.

The second rib may also be lesioned, by contraction of the attached scalenus muscle, or by a vertebral lesion. This rib, with the first, forms the uppermost intercostal space.

The lymph flow will be interfered with if there is undue intercostal tension, as by separation of the two ribs through stress or lesion, and lymph blockage may occur if the ribs are approximated through vertebral

lesions or costal subluxations. The postero-lateral intercostal lymph vessels follow the blood vessels, as is the rule elsewhere, and the lymph drainage may be interfered with, secondarily, by the blood supply being checked, or through venous stasis by lack of vascular drainage.

So we might go on, rib by rib, and discuss each intercostal space, but suffice it is to say that single rib lesions may cause a greater proportionate disturbance than group lesions where there is an extended scoliosis of gradual development.

In any instance, however, we are interested in the lymph flow, and especially the efferents that convey the terminal drainage. The thoracic nerves are nourished by a regulated blood supply. The lymph enters into the drainage of the tissues and the channels must be kept clear if we wish tone in tissues supplied with blood.

Faulty posture and a drooped chest will not only affect the intercostal venous and lymph drainage but may block the veins and lymphatics of the organs both in the chest and below the diaphragm. We cannot have a blockage at any point between the terminal lymph ducts and a more remote area without a checking of the lymph flow beyond the point of blockage. The proposition is similar to that of the blood stream. Impaired intercostal drainage will prevent hepatic, pleural and diaphragmatic lymph flow.

In fairly normal conditions the interference with lymph flow at any point may not mean systemic disturbance, but if there exists inflammation as is found in certain organs and coverings when certain diseases are present, we find the collateral anastomotic lymph vessels conveying and spreading the toxic products, and in malignant cases regurgitation in some instances, as referred to in another section.

In certain dissections we have observed nodes more numerous than found in bodies where no malignant conditions exist. In the epigastric region especially the blockage in the venous tissues and the resultant thickened tissue, through congestion and toxic deposit, there are numerous small nodes and disturbed lymph afferent and efferent vessels, which allow a more widely spread toxic condition.

The lack of rib movement in certain cases where the spinal and costal muscles are almost rigid through colds or lesions or even organic reflex irritation, all point to a checking up of the lymph flow in the intercostal vessels and nodes; also in the trunks leading to the subclavian vessels. There must be freedom of chest movement, as mentioned by Dr. Bush in her chapter on exercises, if we may expect free lymph flow in the afferents. There must also be motion in every thoracic articulation to insure intercostal lymph and blood flow.

The vasomotors that control the intercostal arteries have an indirect influence on the lymph flow. The better the blood circulation in both arteries and veins, the more normal will be the lymph flow. A subluxated rib may affect the lymph flow sufficiently to cause poisoning of the tissues around a nerve. Thus we see in herpes a breaking out on the skin due to a lesion affecting the nerve and its sheath.

In almost every instance an osseous lesion will cause a lymph disorder as well as vascular irregularities and nerve instability. The lymph spaces are almost everywhere and they must be reckoned with if we wish healthy tissues. Wherever there is muscle rigidity or tension we will find the lymph spaces and vessels more or less blocked by undue tension and altered vascularization.

The lymph flow must move onward just the same as the venous blood, or there will be pathological changes as a result of the inactivity. The lymph passes through nodes continuously in a normal tissue condition. The checking of this flow through any of the causes that interfere with the nodes' activities, or of the lymph vessels' conveying properties, will mean a changed lymph substance. If the nodes collect and retain lymph laden with toxic productss, uppuration will result. Should this occur in the bronchial nodes, there is danger of tubercular infection in the lung tissue from the broken down nodes that lie along the branches of the bronchial tubes.

If the nodes in the mammary gland become enlarged and indurated and then malignant, through adjacent tissue and duct poisoning, there is danger of spreading of this substance through the lymph vessels. The lymph must be conveyed to the subclavian veins without nodular retardation to be good lymph. The moment there is a checking of the lymph flow in the vessels or nodes, that moment the lymph is altered in its consistency. The influence on the immediate tissues surrounding a blocked lymph node may be observed in palpable areas, and if there is continued blockage and nodular enlargement, the other nodes and vessels may cause the disorder to become a systemic one instead of local.

The whole system of lymphatics may become altered eventually, through a primary pathological area in which there has been retained toxins followed by suppuration.

Lymphatics of the Heart and Pericardium

The relation of the heart to the trachea allows lymph drainage of both to readily enter the tracheobronchial nodes. The plexus of lymph vessels in the endocardium communicate freely with the plexus found inside the visceral pericardium. The efferents follow the coronary

vessels in the grooves on the surface of the heart and the right and left vessels pass backward in relation to the pulmonary artery to reach the trachea and bronchi.

The lymphatic drainage of the heart is worthy of special consideration. Here we have an organ in a class by itself; a moving organ, pulsating and pumping blood all over the body after receiving it, with valves opening and then closing. The lymph vessels are moving also with the heart in motion, and they are also influenced by the constant contraction and relaxation of the cardiac muscle. Possibly nowhere in the body do we find a better lymph flow than in the heart, and its covering, the pericardium. The absence of nodes is explained by the active drainage through the efferents. Nodes are practically unnecessary, and if present might, in certain cardiac disorders, cause undue pressure and disturbance to an organ that is sensitive to pressure or stress. The lymph spaces between the bundles of cardiac muscles in the connective tissue communicate with the vessels in the endocardium and epicardium. Thus we have normally a perfect drainage of lymph from the heart to the nodes on the trachea and its divisions. It is through a blockage of the tracheobronchial nodes that we find interference with the lymph flow in and around the heart. In tubercular conditions of the lungs, when there are enlarged tracheobronchial nodes and suppuration, a secondary effect upon the heart is noticed. The cardiac efferents no longer drain the lymph freely into the nodes and terminal efferents. There is a tendency toward coronary vessel thickening and hardening. In angina we find the lymph drainage has been checked and a deposit formed that is due to continued lymph blockage. Again we find the cardiac nerves affected by lymph blockage and node enlargement in the areas where the nodes are adjacent to the cardiac nerve trunks. The cervical cardiac sympathetics as well as those coming from the pneumogastric may be compressed by poor lymph drainage in the cervical nodes and vessels. There may be an edematous condition of the tissues in the neck and throat due to lymph blockage that will reflect upon the tone of the cardiac nerves. Likewise, a thickening of the tissues around the trachea and bronchi may cause pressure that will reflect itself upon the base of the heart and the superficial and deep cardiac plexuses. The lesions that cause vasomotor instability of the coronary arteries and blood vessels leaving the heart, pulmonic and systemic, may influence the lymphatics in the walls and around the heart. The blood supply to the various cardiac nerves and plexuses may cause a change in the lymph spaces which, in time, will produce a slight cardiac variation of rhythm. This has not been accounted for in the various treatises on

heart diseases, but we have found that the lymphatic system plays a goodly part in the rhythmic action of the heart. In one case treated some months ago, when an accelerated cardiac action existed, we noted a lymph blockage and nodular enlargement in the cervical region accompanied by edema in the supraclavicular area. Desirous of regulating the heart's action by a better lymphatic drainage, we worked to that end. Reduction of cervical nodes and a better drainage of the efferents from the tracheobronchial nodes brought about a more normal heart action in a very short time. We assumed that the lymph spaces were more or less blocked in the cardiac muscle tissue and poisoning or irritation had existed through lack of free drainage of the lymph in the right and left trunks that go to the tracheobronchial nodes. The lymph had been retained too long, and the effect upon the cardiac muscle was observed. The cervical area also had its influence on the cardiac nerves through lymph inactivity, and the edematous area above the clavicles aided the blocking of the lymph flow from the lower nodes and efferents.

In cases of goitre we also have noted that a part of the cardiac variation from normal was due to lymph blockage in the region of the thyroid vessels. Pressure of the gland also affected the nerves. Interference with the blood supply of the heart and pericardium affects the lymph stream in the grooves containing the blood and lymph vessels.

Too little attention has been paid to the lymphatic consideration in relation to heart action. Hardening of the coronary arteries is a lymph proposition to a great extent, and the primary lymph blockage may be at a distant point. The effect of costal and vertebral lesions on the flow of lymph has been discussed in another section, but we wish to emphasize again the importance of free lymph drainage through the correction of lesions that will block the lymph flow from the tracheal region and cardiac efferents. Very little lymph flow interference in the auricles and ventricles will in time cause a cardiac fluctuation from normal. We may look for this in cases where there is bronchitis and nodular enlargement above the clavicles.

Lymphatics of the Esophagus

This tube is of sufficient length to have at least two collecting systems of lymph vessels. We find the network of lymphatics in the muscular coat collected by the submucous. They collect from the lymph spaces in the mucous tissues and in the lower part of the esophagus the drainage is toward the nodes in the coeliac region. In the upper part of the esophagus the posterior mediastinal nodes receive the afferents and convey the lymph by efferents to the subclavian veins. The

esophagus is drained then by nodes that lie adjacent to the tube. The flow of lymph depends chiefly upon the normal activity of these adjacent nodes. The lower drainage will depend upon the patency of the thoracic duct that indirectly receives the lymph vessels from the esophagus. It is the upper drainage that is the more important as all of the lymph must eventually reach the thoracic duct and subclavian vein in some way.

Should there be bronchial affection and enlarged nodules in the posterior mediastinal area, the lymph checking will be reflected upon the drainage of the esophagus. The vasomotor control of the blood vessels to the esophagus will indirectly act upon the lymph vessels.

Lesions that cause a vascular irregularity in the esophageal tissues will block the lymph spaces and cause retarding of lymph that will produce a change in not only the mucous tissues but in the lymph fluid. Retardation of lymph in the lymph spaces for any period will cause changes that in time will interfere with the normal action of this tube.

The nodes that collect the lymph from the esophagus also collect the lymph from the diaphragm, upper surface of the liver, and sometimes a part of the pericardium.

The extent of lymph interference then may be reflected upon several membranes as well as the esophagus. It is impossible to check the lymph flow in certain nodes without affecting in some regions several different organs or membranous coverings.

The esophagus may be constricted through lesions, and when this condition is present we also find a lymph space obstruction which reacts and makes the altered change more marked.

The esophagus passes through the diaphragm and we may find there at times, through costal lesions, an altered flow.

In gastroptosis the esophagus is extended sufficiently at times to affect the lymph in the spaces of its mucous and muscular tissues. The absence of nodes within the esophageal tissues throws the burden on the collecting nodes in adjacent areas. The terminal drainage points must receive the most consideration.

CHAPTER FIVE

LYMPHATICS OF THE ABDOMEN AND PELVIC REGION

Lymphatics of the Diaphragm

While there is a free anastomosis between the plexuses of lymph vessels on the thoracic and abdominal surfaces of the diaphragm, yet the drainage vessels collect from above and below. The diaphragm occupying a dome shaped area of considerable extent empties its lymph on the thoracic surface into the lymph nodes that lie in the various adjacent regions. The pleural sac contains lymph vessels that communicate freely with those of the thoracic surface of the diaphragm. The lymph vessels are more numerous at the points of contact of the pleura and diaphragm.

Thus the lymph vessels in the region of the aorta, where it passes in relation to the diaphragm, enter these nodes, while the esophageal nodes collect from a more central portion, and the sternal nodes from the anterior vessels. Two of the three areas mentioned contain nodes that join or help to form the mediastinal drainage system. The drainage of the thoracic surface of the diaphragm will depend upon the normal functioning of the nodes on the aorta and esophagus first, and upon the mediastinal nodes second, before the final efferents enter the subclavian veins. The anterior area is drained by the nodes behind the sternum and costal cartilages. These nodes give afferents to the internal mammary chain of nodes that follow the course of the internal mammary artery. We see then that a portion of the thoracic lymph drainage of the diaphragm is collected by the lymph vessels and nodes lying behind the sternal ends of the ribs and a portion is collected by the mediastinal nodes that lie in relation to the aorta and posterior mediastinal glands.

The attachment of the outer border of this drum-head-like muscle membrane suggests the possibility of costal lesions affecting its vascular and lymph drainage. The nerves to the diaphragm are given off high up, in the cervical region, and lesions in that area may disturb its innervation. The most probable and most likely disturbance of the lymph flow in the diaphragm is through the lymph vessels in the pleura and liver.

The presence of septic conditions in the pleura will affect the lymph stream in the diaphragm. The portion of the pleura adjacent to the diaphragm is drained by common efferents. While this is only a small

portion of the pleura, yet we find in septic conditions a great amount of lymph blockage and nodular enlargement.

The correction of costal lesions and the regulation of the circulation will clear the lymph stream unless there is a great amount of septic poisoning. The abdominal surface of the diaphragm on the right side is in contact with the liver and the communicating lymph vessels are numerous.

The subperitoneal tissue vessels also anastomose at the periphery of the diaphragm with its lymph vessels. Here we may again have septic infection through the lymph vessels that anastomose so freely. The aortic nodes collect the lymph on the right side. There are also a few nodes on the inferior phrenic artery.

The esophageal nodes, also aortic, collect lymph from the diaphragm on the left side. The esophageal nodes are near the stomach end of the tube. The aortic nodes are to the side and in front of the artery. These nodes have efferents leading directly or indirectly into the receptaculum chyli or lower portion of the thoracic duct.

The liver if diseased will reflect its disorder upon the lymph vessels and nodes that drain the diaphragm. Thus we see the diaphragm lies in a position that allows of septic infection through the pleura, diaphragm and subperitoneal tissue.

Unless there is a malignant condition in the adjacent organs and tissues the lymph flow can be regulated through correction of lesions and the re-establishing of lymph and blood flow. If there is malignancy it is better to not attempt drainage.

Lymphatics of the Liver

As pointed out in the lymph drainage of the lungs and pleura, also of the diaphragm, the collecting lymph vessels drain areas according to the portion of the organ or tissue that is approximate. The liver, having a great surface and occupying a position that for convenience sake we will call horizontal, necessarily must have a lymph drainage that will be divided into parts corresponding with the mediastinal divisions. To make it simple to the student, we will state again that lymph drainage usually follows lines of least resistance, so to speak, and that place is along the course of vessels or of tubes. The hepatic veins lead to the inferior vena cava and we find the lymph vessels from the posterior surface, both deep and superficial, follow along this path. These collecting vessels pass to the nodes around the uppermost part of the inferior vena cava and communicate with the posterior mediastinal nodes. You will remember the short terminal distance the vena cava has after re-

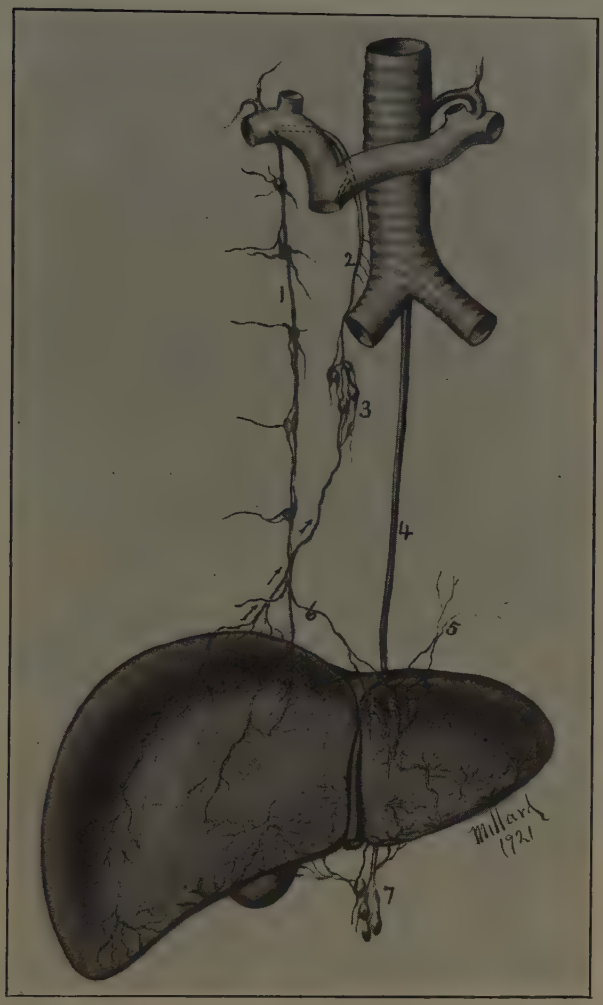

PLATE XVIII. The terminal drainage of the liver through the three-fold channels.—(1) Internal mammary chain. (2) Mediastinal lymph drainage. (3) Nodes near inferior vena cava. (4) Thoracic duct. (5 & 6) Lymph channels from nodes back of ensiform cartilage. (7) Receptaculum chyli.

ceiving the hepatic veins, also the relation of the vena cava to the posterior mediastinum. The convex surface of the liver that is in relation to the diaphragm has at a few places lymph vessels common to both and we find the nodes on the anterior superior surface of the diaphragm behind the ensiform cartilage collecting lymph for the internal mammary nodes.

The under surface of the liver and the bile ducts have lymph vessels that pass to the hepatic nodes and pericardial nodes of a chain that supplies the gastric lymph area. The lymph vessels in the esophageal opening of the diaphragm convey lymph from portions of the liver in that region to the gastric chain of nodes. These are also in communication with the lymph vessels of the pancreas. Thus, we have the lymph vessels passing along the hepatic veins to nodes on the vena cava inferior, others passing through the diaphragm in esophageal opening, and still others traversing the diaphragm near the front to enter the anterior mediastinal nodes that form a part of the internal mammary chain.

The lymph from the under surface of liver is collected by tributaries of the receptaculum chyli directly or indirectly. These latter vessels follow the hepatic artery, bile ducts, portal vein, and through the hepatic nodes. This arrangement makes the lymph drainage simple to understand; the hepatic veins, inferior vena cava, esophagus, hepatic artery, bile ducts and portal vein are all followed by lymph drainage vessels. The lymph vessels pass through the diaphragm at three points. The inferior vena cava opening, the esophageal opening and direct traversing of the diaphragm at the anterior portion to reach the nodes behind the ensiform cartilage.

This three-fold system of lymph drainage has various points of termination. The lymph vessels that follow the hepatic veins and inferior vena cava are received by nodes that are in the chain of the posterior mediastinal node group. These nodes have terminals in the right lymphatic duct unless, as sometimes is the case, they have separate terminals in the subclavian vein. The second drainage point is through the internal mammary nodes that have final efferents into the subclavian vein or the larger right lymphatic duct; the third drainage vessels are those that are collected in the receptaculum and its tributaries to be conveyed by the thoracic duct.

To summarize the drainage: there are, first, the right posterior mediastinal; second, the right internal mammary chain; and third, the thoracic duct collecting lymph from the liver through hepatic, gastric and pancreatico-duodenal nodes in the region of the receptaculum chyli.

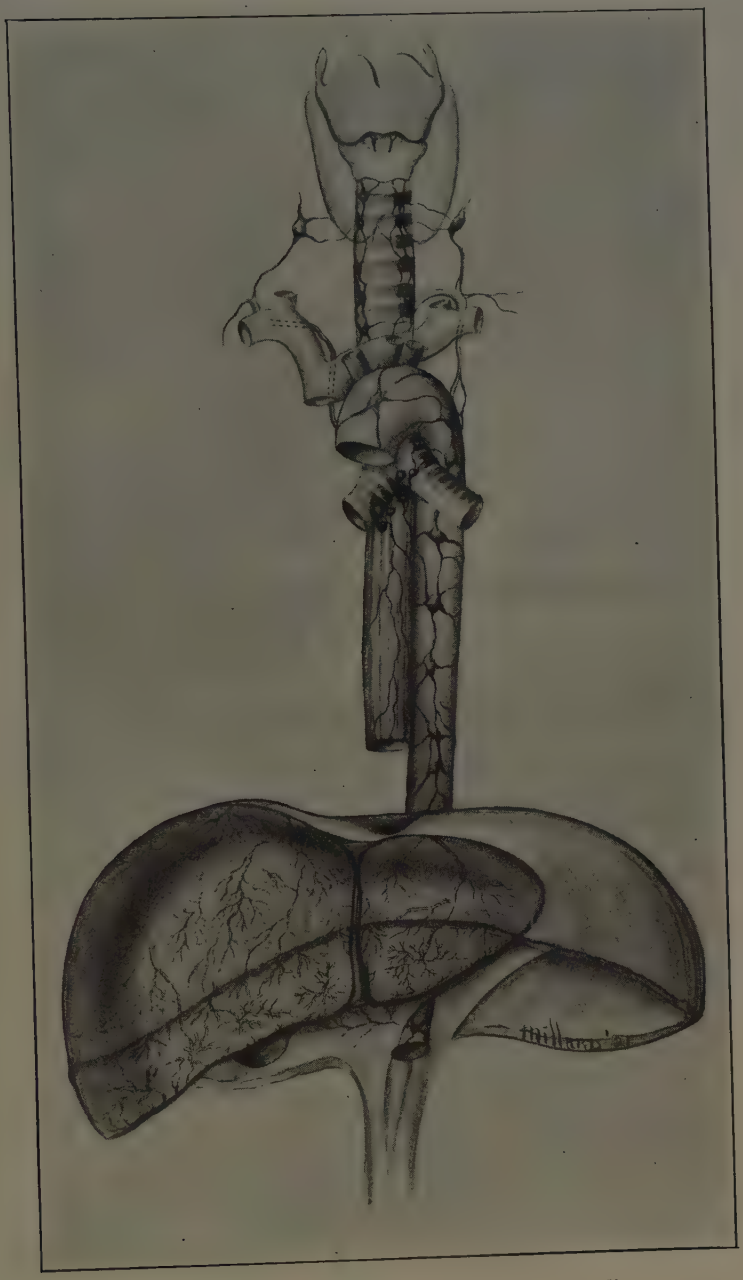

Plate XIX. Lymphatics of the surface of the liver.

In diseases of the liver we have then three different sets of lymph vessels conveying toxic or possibly septic products. The internal mammary chain of nodes may be blocked or enlarged. This will interfere with the collecting of lymph from the anterior intercostals and the inner surface of the breast, as well as from the deeper areas of the anterior thoracic wall which includes the portion of the pleura in that region.

The posterior mediastinal nodes receive lymph that has followed along the lymph vessels in relation to the hepatic veins, and inferior vena cava. Should there be an enlarged condition of these nodes through lung affection, or from any congestion or infection of the various tissues and organs drained by these nodes, we will find the liver flow checked. This may cause other lymph vessels in the liver to take up in part the work of lymph drainage.

The third drainage point is through the thoracic duct and here we may find the greatest amount of blockage. The hepatic nodes, the gastric nodes, and the pancreatico-duodenal nodes receive and convey to the thoracic duct a large part of the liver's lymph. In gastric disorders, not necessarily malignant, we may look for enlarged nodes, also in disturbances of the pancreas. There may be lymph blockage from a gastro-duodenal ulcer. All these may reflect upon hepatic drainage.

The lymph vessels of the liver are numerous and are divided into the superficial and deep, but they all pass through the three sets of terminals outlined above. Eventually they reach the subclavian veins. In malignancy the liver may convey septic products through any of these three separate channels. The puffiness above the clavicles, including involvement of the supraclavicular nodes, mentioned by Osler, as occurring through the internal mammary chain, is not as likely to occur as in the more direct involvement through the other two drainage systems. The posterior mediastinal collect hepatic lymph more direct than does the internal mammary chain and the vessels are from a deeper portion of the liver. These mediastinal nodes send efferents that have a terminal similar to that of the internal mammary chain of nodes and the involvement of the supraclavicular nodes of the former is much more likely. The thoracic duct drainage of the liver lymph is less direct as the lymph must pass through various nodes before being received by the thoracic duct.

There is a lessened chance of liver malignancy if we keep the lymph drainage free. We have pointed out elsewhere that the liver is the chief organ in systemic pollution—that in the majority of cases the liver is involved primarily and the other organs are affected secondarily. If the lymph drainage of the liver is blocked it is only a short time be-

fore some other organ will take on a diseased condition. The three drainage systems from the liver include the three systems that also drain the major portion of the body's lymph.

The right mammary chain of nodes collects the lymph of the liver from a small area only. The left mammary chain may receive part of this as the two chains are connected by lymph vessels, but Osler refers to the involvement of supraclavicular nodes on the left side in particular. We find the right side is the important one as the right chain conveys most of the lymph from the anterior diaphragmatic nodes through the nodes back of the ensiform cartilage.

The right broncho-mediastinal trunk likewise collects some lymph from the convex surface of the liver. Very little lymph from the convex surface of the liver reaches the left subclavian.

The liver has so many vessels and ducts that the lymph stream is well conveyed, but at the same time, there is no organ that blocks itself quicker than the liver. The many functions of the liver and the receiving of the portal vein with its vast distribution and the hepatic veins collecting and emptying into the vena cava, along with the biliary ducts carrying bile into the duodenum, gives us an insight into the lymph vessel blockage that may occur if this organ becomes diseased. The hepatic artery supplying the liver has vasomotor regulation and indirectly the lymph stream is augmented by the normal tone of the artery and its branches. The better the blood circulation the better the lymph flow. Thoracic lesions that interfere with the blood flow to the liver will cause a lymph retardation through the organ. Lesions that interfere with the lymph vessels and nodes between the liver and the subclavian veins must be corrected if we expect good lymph drainage. The left subclavian collects the major part of the liver's lymph; the right lymphatic trunk only part from its convex and posterior surface.

We must look to the left postclavicular area for thoracic duct drainage. Cervical lesions, first rib, or clavicular subluxations may have a bearing on the liver's lymph drainage. We usually think that we reduce an enlarged liver or restore its various functions to normal by the correction of thoracic lesions at the nerve centres to the liver, but we must not overlook the lymph drainage which has its terminals through three different courses before it reaches the subclavian veins.

Lymphatics of the Stomach and Intestines

In the cardiac lymphatic system we spoke of the lymph flow being accelerated by a constant moving of the lymph vessels located in an organ that is beating almost continuously. In the stomach we have

lymph vessels in and on the walls of an organ that has a churning movement and is capable of great expansion through its contents as well as by the presence of gases. The stomach has a goodly number of nodes lying between the folds of the omenta, as well as being distributed around the cardiac end of the stomach, the pericardial, also the pyloric end, the subpyloric.

The mucous membrane lymph vessels pass to the sub-mucous. Collecting trunks pierce the muscular coat in the lesser and greater curvatures and these afferents are received by the gastric chain. Efferents from the gastric enter the preaortic nodes of the coeliac group to enter the receptaculum chyli as separate trunks or as the combined channel known as the intestinal lymphatic trunk.

After all, the lymph drainage of the stomach as well as of the spleen and pancreas eventually is collected by the coeliac group of nodes which lie in front of the aorta in relation to the coeliac axis. The main lymph nodes and vessels, as in the other organs, lie along the course of the blood vessels. The lymph drainage of the stomach is such that certain areas are drained quite independently of others. This is of value when there is a pyloric diseased condition, the fundus of the stomach may not be blocked or involved. The splenic nodes receive a part of the stomach's lymph along the splenic artery. Again we will note, as in cancer of the breast and other organic infectious areas, there may be a regurgitation of lymph.

In treating the stomach for a better lymph flow, we will find it necessary to work with the view of, first, a free thoracic duct drainage by keeping the terminal clear in the clavicular region, and second, by a free lymph flow in the coeliac region.

The vasomotor control of the gastric blood vessels will help to clear the lymph vessels and nodes. Should there be lesions that cause gastric atony we will expect lymph retardation.

Gastroptosis will prevent gastric lymph vessel efferents from clearing the lymph spaces. As the lymph vessels of the stomach have a common duct drainage with the spleen, pancreas, and mesenteric area, in some instances we must try and determine the amount of blockage that already exists when there is stasis or ptosis of the abdominal viscera. The receptaculum chyli is quite protected by the abdominal aorta and if no aneurism exists or thickened tissues in this region the most important lymph area to note will be that of the preaortic nodes. The reduction of lesioned areas that control the blood vessels that supply and drain the gastric area is of primary importance. On first thought, the

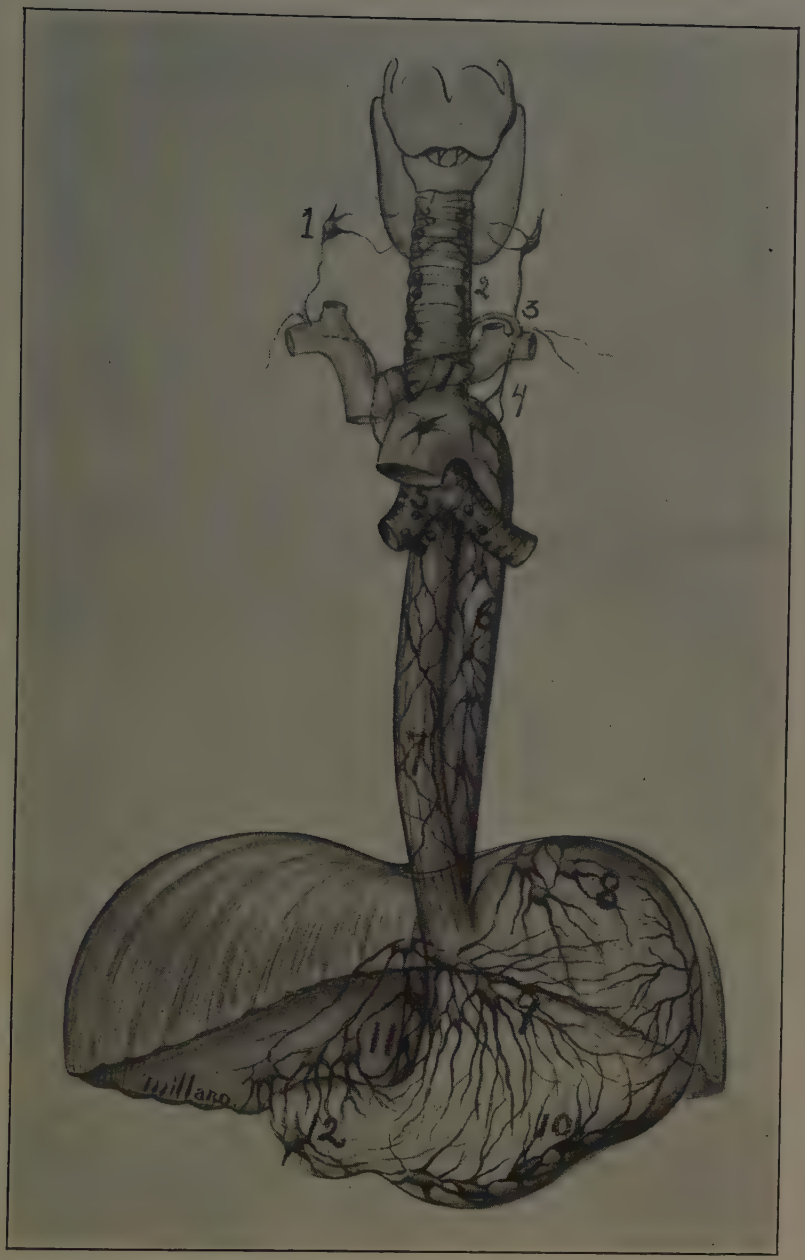

PLATE XX. Lymphatics of the Stomach.—(1) Cervical node. (2) Tracheal nodes. (3) Thoracic duct. (4) Mediastinal efferents. (5) Bronchial nodes. (6) Aortic nodes. (7) Esophageal lymphatic vessels. (8) Left Pericardial nodes. (9) Right Pericardial nodes. (10) Right gastro-epiploic nodes. (11) Gastric and pancreatic nodes. (12) Subpyloric nodes.

student may picture the receptaculum chyli as lying in front of the aorta and subject to gastric pressure and even contact, but we will remember the relation of the aorta to the receptaculum chyli and note that it is the ducts leading to it that are subject to compression and blockage. The diaphragm may be drawn unduly by cervical. lesion affecting phrenics, and by lumbar or costal lesions, and this may affect the lymph flow to some extent. The thoracic duct follows along the aorta in its relation to the diaphragm, but lies in a position that is more subject to vertebral lesions. The great proposition in abdominal lymph drainage is one of stasis and ptosis. The entire alimentary tract may have a ptosic expression, a general visceroptosis.

About 90% of white people are constipated. The vast majority are slaves to laxatives. Some take oil, others anything from senna to salts. It is easy to reason out the effect constipation has on the lymphatics. The great receptaculum chyli with its numerous tributaries is in a constant state of over taxation. Ptosis and venous stasis are inevitable. The lymph vessels and nodes in the mesentery are chronically enlarged and overburdened. The dragging down of the transverse colon, including the hepatic and splenic flexures, interfere with the drainage of the lymph in the reservoir. Auto-intoxication includes lymph retardation. Toxic accumulation is obvious when ptosis or stasis is present.

Splanchnoptosis is one of the vital causes of lymph blockage. The vasomotor control of the abdominal viscera normally is possibly one of the best arranged systems in the body.

The vasomotor nerves in the visceral vessels are more elaborate than found elsewhere. The preganglionic fibres are longer and are not supplanted by the postganglionic fibres until the solar plexus is reached. This gives unusual tone to the vessels given off from the abdominal aorta. But ptosis alters this normal condition and we find not only a lack of tone in the vasomotors, but a faulty innervation impulse in the peristaltic arrangement and control. The sagging of the bowels produces stress upon vessels, nerves and lymph channels.

No organ or tissue remains normal where there is an altered position in the respective regions. Perfect tone is found where vascularization and innervation remains unimpaired. If the intestines are sagged out of normal line the mesentery is likewise malpositioned and the lymph vessels are not free to carry away their load of lymph.

There is only one method of correcting stasis and ptosis, and, thanks to the osteopathic technique, we may by adjustment relieve the stress and restore the sagging viscera. We find the spinal column a container

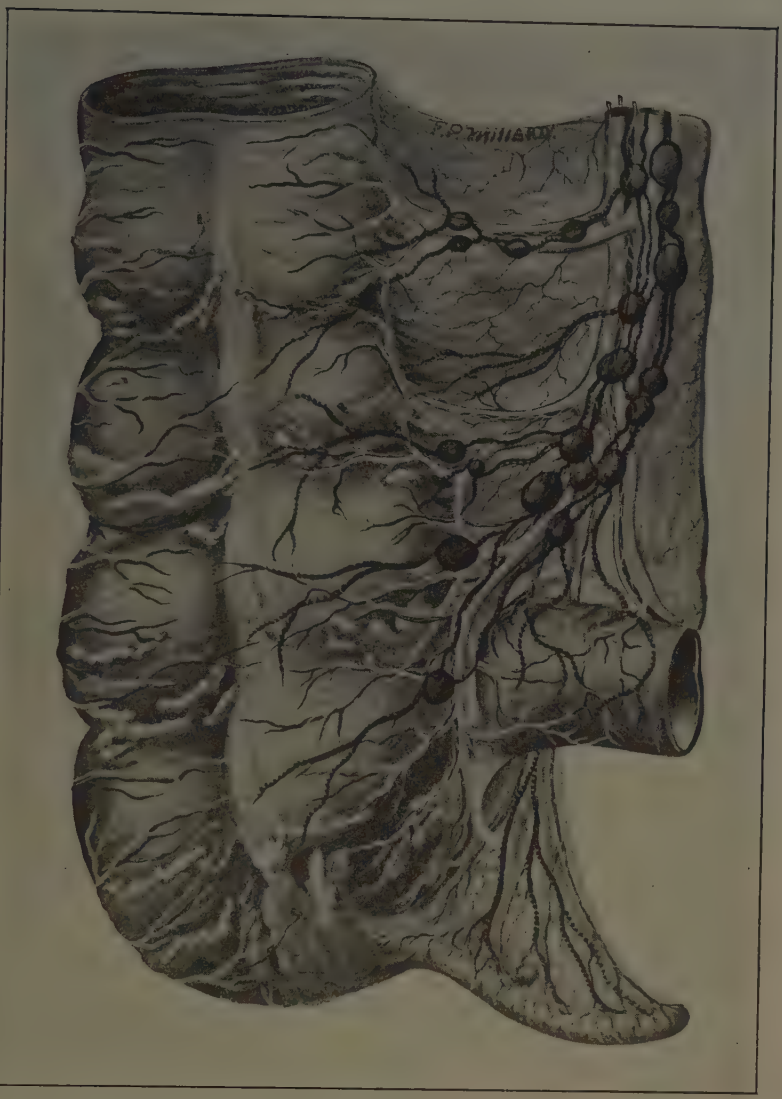

PLATE XXI. Lymph drainage of the caecum and appendix. The ileo-caecal, anterior caecal nodes and vessels are shown, also the node of the appendix.

of these nerve impulse centers that control not only the circulation but the nerve tone and vermicular action of the alimentary tract. We must look to the correction of lesions and scoliotic conditions for a remedy in abdominal disturbances.

First we must correct innominate lesions, if they exist, as it is useless to attempt spinal correction with the expectancy of permanent results without first having the foundation of the spine in perfect alignment. The sacrum must be true to its axis in relation with the innominates. A tilt of the sacrum may be detected when least expected. The limbs must be of equal length, unless a previous break or faulty malnutrition has shortened one. Perfect alignment of osseous tissue first is necessary.

Various vertebral and lower costal lesions, so often found in ptosis, must be corrected as nearly as it is possible before we may expect a free flow of lymph. The region of the diaphragm is also very important. An enlarged liver, spleen or pancreas with gastroptosis must command consideration before we attempt to secure a normalization of the transverse colon.

In order to reach the innervation and vasomotor control of the organs and tissues that are within the region of the diaphragm we must need look higher up for costal and vertebral lesions. This reverts to the statement that the entire framework must be in perfect alignment.

Just recently I assisted in an autopsy which gave me additional data. The case was of peculiar interest as I knew the subject had been given serum treatment for a duodenal growth. We spent some time in this post mortem and I examined with care the state of the lymphatics. Each organ below the diaphragm was overhauled to determine the amount of lymphatic involvement. It was almost beyond comprehension. I never knew so many nodes existed. Every node seemed enlarged and indurated. The jaundiced condition due to duct blockage, and the gastric outlet almost beyond recognition was surrounded by a lymphatic enlargement and nodular retention that had defied correction.

Just today I examined a woman with hepatic congestion and biliary obstruction that showed, on palpation, the abnormal condition of the lymph glands.

If one is sufficiently interested in lymphatics to carefully palpates in every accessable region, it is astonishing how the condition of the nodes will index the patient's complications.

We have called attention to the fact that no organs containing lymphatics can be involved without a corresponding lymphatic disorder.

PLATE XXII.—The lymphatic nodes, in some regions, not only contain vasomotor nerves but have definite nerve plexuses. The mesenteric nodes lie in relation to the vessels and are more numerous in diseased visceral areas than is commonly thought. The vasomotor arrangement of the mesenteric arteries is shown in relation to the cord and sympathetic nerve chain.

We may not be able to palpate the lymphatics in all abdominal organs, but in many instances we can learn to detect enlarged nodes or lymphatic blockage.

In a measure we can estimate the amount of lymph blockage by the degree of ptosis. We can also determine to a certain extent the lymphatic involvement by the torsion in the duodenum when gastroptosis exists.

The question of lymph regurgitation in gastric trouble is verified in operations for duodenal and pyloric constrictions.

The relation of the kidneys and suprarenals to the cisterna chyli is also significant. The pancreas, with its peculiar position and relation to the stomach and duodenum, gives us an insight into the lymphatic disturbances found in gastric malpositions.

We have a lot to learn yet as to the real part played by the lymphatics in their relation to the ductless glands, but we have come to believe the physiological chemistry of the body is dependent upon the state of the lymph. Faulty metabolism must include a blocked lymphatic system at some point at least. The restoration to health depends upon the degree of lymphatic vessel tone and freedom from obstruction.

The nerve centers that control the abdominal lymphatics correspond in a measure to those of the vasomotors to the abdominal blood vessels. Perfect alignment of osseous tissue and reduction of organic congestion will clear the lymph vessels if ptosic conditions are remedied, unless there is malignant trouble. Recently I examined a woman of 53 who complained of gastric disorders. Upon thorough examination I discovered a growth in the region of the duodenum. X-ray confirmed the diagnosis. The case was a typical one of lymphatic engorgement. The growth suggested malignancy. Upon reconsideration I decided to pass the case up. The involvement was too great and if malignancy existed it seemed too great a risk to overstimulate the lymphatics. This case was an extraordinary one and in her atonic condition I felt justified in not attempting what might prove a fruitless task. It seems wise sometimes to give in to doubt rather than to face a defeat later and be accused of spreading the toxins.

There is a limit to the clearance of lymphatic blockage and it is well to know when to halt. An overtaxed system with constitutional disorders of numerous phases may not be cleared even by the most dexterous adjustment and correction. The lymphatics are sometimes so badly complicated that to attempt to clear them may mean adding fuel to the fire. I have admitted this point just to show how I feel in these

severe cases. But the ordinary cases, where no indication of malignancy is present, justify us in attempting at least to clear the circulation and lymphatic glands of their load.

In this age when cancer is so prevalent it is well to be on constant guard to detect growths or conditions that indicate an incurable phase. We are laboring to clarify in our minds as nearly as possible the state of the abdominal viscera in their various relations to the benign and malignant classifications. This may not be possible, but we can come nearer to it by study and research.

The lymph drainage of the appendix is of particular value. There is usually at least a node which collects the lymph from the afferent vessels. We have found that in appendicitis there is an enlargement of the inguinal nodes of that side. This may be accounted for in two ways. First, there is sufficient lymph blockage in this region to cause enlargement of the cecal nodes. The mesenteric nodes are also enlarged and through the tissue congestion and venous stasis the lymph stream is checked by an overtaxed drainage centre, the beginning of the thoracic duct. This reflects upon the emptying of the lymph from the inguinal region and there is a blocking and enlargement of the inguinal glands. This may be noted in almost every instance where appendicitis is present. Second, there are lymph channels in the inguinal region that have collecting tubes from around the appendix, but not anastomosing. These lymph afferents are blocked or overloaded through congestion and disturbed vascularization of the cecal area. If pus is present in the appendix, the inguinal nodes are more readily palpable. We have stated elsewhere that surgical resort may be determined absolutely by the condition of the right inguinal glands. For years I have based my final diagnosis in operable cases on this finding. After all other tests are made, the index as to pus finding is determined by the palpation of these nodes.

Lymphatics of the Kidneys

The kidneys lie in a position that is relative to the beginning of the thoracic duct. The lymphatic vessels follow the arteries, as usual, and are of more significance than usually ascribed to them. The numerous lymphatic capillaries in the medulla and cortex have an influence on the tubules. The vascularization of the kidney substance aids the lymph stream in that there are more definite channels than found in some organs. We find that a blockage of the lymph stream in the region of the nodes that receive afferents from the liver, stomach and pancreas reflects itself upon the lymph stream from the kidneys. The

blocking of preaortic nodes that receive lymph vessels from the kidneys causes a blockage of the lymph in the cortex and medulla. The effect upon the kidneys is marked, and we have noted that in certain kidney disturbances that normal functioning did not return until the lymph stream was cleared and allowed free drainage from the deeper lymph vessels. Again we note the disturbance of the lymph flow when there is faulty innervation, not only to the kidney blood vessels but to the nerve fibres to the tubules. The lymph stream is influenced by the nerve supply to the vessels and tubules to the extent of causing a variation in the flow of urine. The correction of lesions that have caused instability of nerve tone brings about a more normal flow of lymph, and the organ functions better. A lower costal lesion may cause vascular and lymph irregularities of flow, and derange the finer mechanism in the medulla and cortex of the kidney. Lower thoracic vertebral lesions interfere with the renal plexus of nerves and in this way bring about variations in the secretory cells.

We have noted in Bright's disease that the lymph stream was blocked decidedly, and that by indirectly influencing the lymph channels through vasomotors to the blood vessels the change in the tubules made repair quite satisfactory. Bright's disease is to a great extent a lymphatic disorder. The treatment should be to the end of freeing up the efferent lymph channels in order that the kidney drainage of lymph may be more complete. The collection of the lymph from the superficial vessels is of less importance. The channels eventually end in the nodes around the aorta and the lymph is collected at the beginning of the thoracic duct. There are so many lymph nodes and vessels in this small area that it is reasonable to expect an overtaxed condition of the nodes if there exists any organic disease of any of the adjacent organs. The blockage of the nodes and channels from the stomach or mesenteric region will have its influence upon the renal lymphatics. Ptosis of the stomach will also have a bearing. Correction of all lesions to this area will relieve the kidneys and make the urine more normal in color and quantity. We have never paid sufficient attention to the lymphatics of the kidneys in the various diseases of these organs. While diabetes is a constitutional disturbance, we find the liver and kidneys almost invariably taxed and the renal lymphatics blocked. If you apply specific treatment to the lymphatics in diabetes you will get good results. The hepatic nodes and renal nodes, as well as the mesentery, must be kept free from blockage. If they are blocked you will soon see it reflected upon the drainage of the pelvis and even the inguinal and popliteal nodes. The lymph drainage below the kidneys will not

PLATE XXIII. The lymphatics of the kidneys.

be normal if there is enlargement of the nodes and blockage in the lymph channels in the region of the receptaculum chyli. First we must work to secure good vasomotor control of the branches of the abdominal artery, also the corresponding collecting veins. If we secure this, we can reasonably expect an effect upon the lymph drainage. The lymph vessels follow the blood vessels so closely that we can usually aid lymph flow by vasomotor control of the blood vessels. We are yet to determine just how extensively vasomotor fibres are scattered over the lymph vessels that are so closely associated with the blood vessels. We are inclined to believe that there is more influence brought to bear than we have given credit for. A little further research work will clear this point. We are also yet to determine just how much lymph is collected in the veins over the body outside of the subclavians. As mentioned elsewhere, we believe that in time we shall determine that the entire venous system collects lymph at numerous intervals, as it seems incredible that the entire lymph collection of the body should be confined to the two veins in the base of the neck. If this reasoning is true, it will account for the clearing up of the lymph stream when we secure normal vasomotor control of the blood vessels. The close relation of the lymph vessels and nodes to the veins in many instances allows for collection of lymph in the veins at various points in minute quantities. This is a solution to the problem of the lymphatics in various conditions where there is a lymph blockage and an edematous condition.

The lymph drainage of the kidneys is most important in any and every systemic disturbance. The degree of normal functioning of the kidneys means the blocking or clearing of the other tissues and organs. Specific treatment to increase lymph flow in the vessels leading from the kidneys is most essential.

The internal secretions are influenced by the lymph more than in any other way. Every organ has a blood supply, and along the vessels we find lymphatics with few exceptions. In order to stabilize the body metabolism we must secure perfect lymph drainage. This will allow ductless glands as well as all glands and tissues to put forth normal secretions. The nodes must be kept reduced to normal size and the lymph channels free. There are enough palpable glands to serve as an index to internal systemic disorders. No organ or ductless gland can be involved to any great extent without reflecting its disturbance and blockage on some palpable area. We must look for edematous areas. There are certain areas that denote specific organic lymph blockage. The watching of these regions that are prone to "puff" is very essential. Learn to detect "puffy" areas. They may exist on most any part of

the body. There may be zones that are puffy and cool to the hand. Trace out the lymph drainage and you will locate the organ with blocked lymphatics.

If the kidney lymph drainage nodes are blocked you may find a general edema over the kidneys in the back, or it may be reflected on the abdomen over the beginning of the thoracic duct. Next go above the clavicles and note any edema, and by comparing the three areas you can pretty well decide the drainage of the kidney lymph. If there is a splanchnoptosis present it will be necessary first of all to correct lesions that will allow a return to normal position of the viscera. General alignment will be necessary from the arches of the feet upward to the atlas. General vasomotor tone of the body will greatly accelerate lymph flow. Specific work in one area will not always clear the trouble. The lymphatic system must be considered in its entirety, and we must work to the end of freeing the lymph channels, nodes and ducts in order to reach some specific organ or tissue.

Lymphatics of the Pelvic Region

The organs in the pelvic basin are subject to great stress when innominate lesions exist, and such lesions are not uncommon. Even one innominate in lesion will draw out of line the uterus and ovaries. This unevenness of the basins' walls causes muscles and ligaments attached to the innominate bones to draw in a manner that blocks the blood vessels and lymph channels. Nodular enlargement follows, and a congestion of the tissues is also noticed. If allowed to remain uncorrected, marked symptoms appear, especially at the menstrual periods. Cramps, retarded flow, and sometimes flooding are the result, depending upon the age and general condition of the patient.

As long as osseous lesions exist there will be blockage of blood and lymph vessels. Careful palpation over the ovaries will reveal the change in the tissues. The effect upon the lymphatics in the legs will be apparent. There may be a slight edematous condition around the ankles, and the popliteal spaces are sure to record the blockage that is present higher up.

If the kidneys are active and no constipation is apparent the symptoms are minimized, but in a tilted pelvis there is almost sure to be constipation or haemorrhoids. There is stress upon all the muscles attached to the pelvic basin.

The lymphatic arrangement in the pelvic organs is like that of a great net. These vessels all find an emptying place eventually through one tubet, he thoracic duct. This duct collects from all points below.

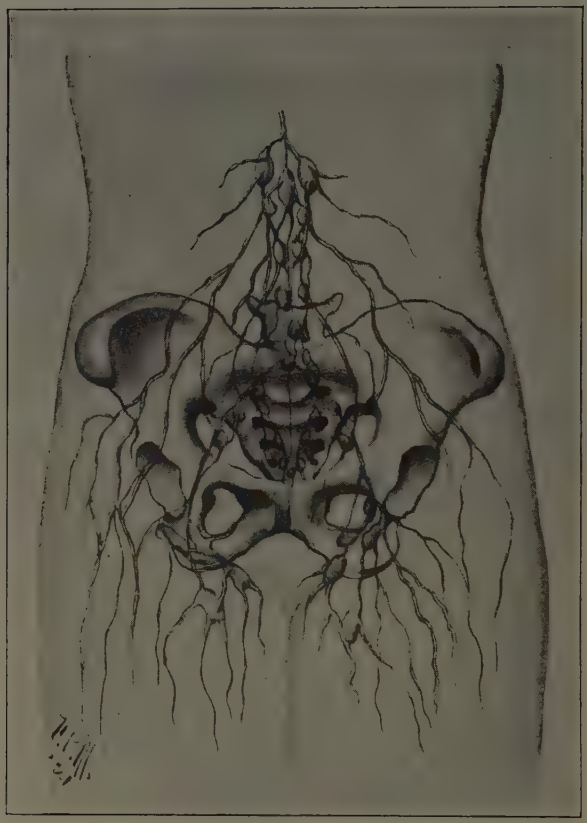

PLATE XXIV. Lymphatics in relation to the pelvis.

The uterine and ovarian lymphatics are blocked when there is undue pelvic congestion. We need not refer to venereal diseases and their marked effect upon the lymphatics. We will confine this article to pelvic lymphatic blockage, through lesions, with resulting ptosis and nodular enlargements.

In order to have a regulated blood supply in the pelvic organs there must be good vasomotor tone at the nerve centers that control the blood vessels, and indirectly the lymph vessels. Cervical and thoracic lesions affect vasomotor control clear down to the feet.

To relieve pelvic congestion and lymph blockage there must be not only adjustment of the pelvic bones but correction of all lesions up to the occiput. A scoliosis will disturb the ovarian nerve centre even though no marked innominate lesion exists. First, last and always in pelvic congestion, we must secure perfect alignment. It is so easy to disturb the pelvic plexus of nerves through osseous lesions, and there is a tremendous reflex following pelvic nerve instability. Splanchnoptosis will produce pelvic lymph blockage in any and every instance. The lymph vessels, when there is no abdominal visceral ptosis and vascular stasis, normally clear themselves and empty into tributaries of the thoracic duct, but if you lesion one or more vertebrae directly, or through innominate or sacral tilts, the whole arrangement is changed. Nerve impulses are lessened, lack of tone is noticed and a congestion or inflammation may be the result. We must keep the organs in the abdomen in their proper tone and respective regions if we expect to have normal pelvic organs. The moment there is venous stasis we have the beginning of lymphatic blockage.

Weakened ligaments allow misplacements, and we find flexions and versions causing nodular enlargements. Varicose veins and edema follow in many instances. If there is a continued lymph blockage in the ovarian and uterine regions, leucorrhea may be the result and often is very persistent. The vascular and lymphatic arrangement is peculiar in the pelvic basin. This allowance is made to accommodate the changes during pregnancy. The lymph vessels are arranged so that the gravid uterus will not obstruct them sufficiently to cause white swelling under normal conditions.

Pelvic and vertebral lesions existing before and during pregnancy cause many symptoms that would not exist had the lesions been corrected before conception.

Where there is albumin during pregnancy, we find the lymph nodes more noticeable and the lymph drainage down the leg more blocked than in a normal kidney condition.

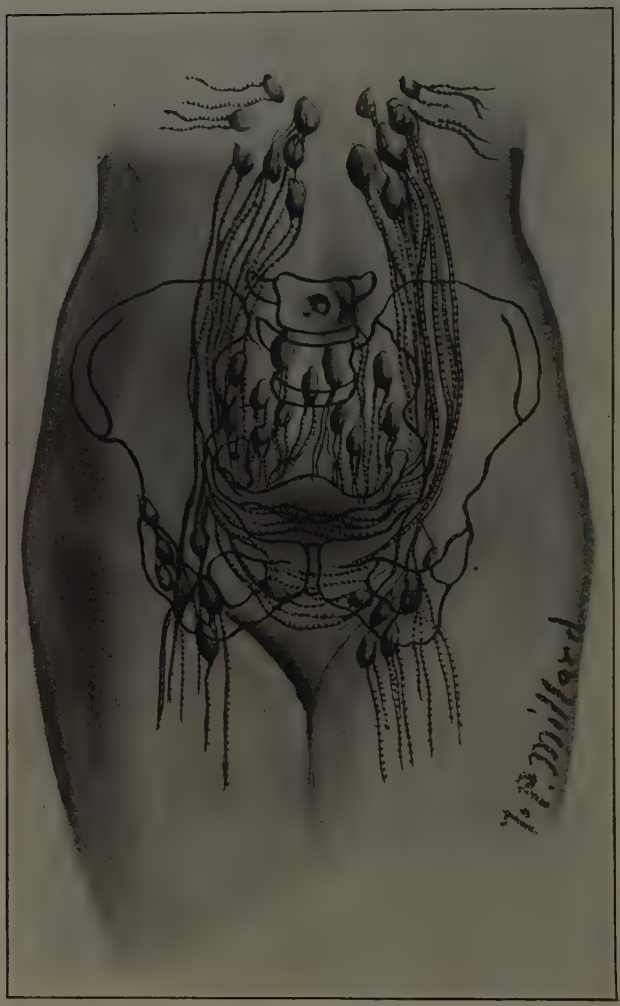

PLATE XXV.—The lymph drainage of the pelvic regions and lower extremity is clearly outlined. In ptosis of the abdominal viscera the lymph nodes are blocked and the lymph vessels drawn downward with the viscera.

Before any woman contemplates pregnancy there should be perfect adjustments made, and a free drainage of the pelvic lymphatics.

The presence of lacerations, long neglected, are causative of nodular enlargement. The absorption of secretions and discharges reflect the abrasion upon the nodules. This may produce sufficient nodular enlargement and lymph blockage to cause intrauterine growths. Any abrasion is followed by lymphatic disturbance.

In cases of a prolapsed uterus we find stress upon the numerous lymph vessels and nodes, preventing the return of lymph through the tributaries of the receptaculum chyli. Constipation with enlargement of the haemorrhoidal veins produces a nodular enlargement that is readily palpable in the posterior walls of vagina, especially back of the cervix.

A lesioned coccyx will cause, through pressure and traction, a series of lymph irregularities.

During the menstrual period there is a temporary lymph stasis and you will notice, sometimes, the inguinal nodes slightly enlarged and yet quite compressible to touch. These clear up shortly after the period.

In rheumatic cases we find the most general disturbance. The presence of uric acid with possibly a mild nephritis, allows the careful palpator to observe some interesting points.

If you will keep the lymphatics in mind constantly and look for nodular variations in all disorders of the organs and tissues, you will be surprised in time to note a peculiar fluctuation of the various palpable nodes in the accessible regions.

I have become so accustomed to palpating nodes that I invariably go over the popliteal, inguinal and axillary regions, just to satisfy myself that the lymphatic system fluctuates, so to speak, according to the chemistry of the body.

The slightest organic disturbance reflects itself upon the lymphatic system at some point. An abcessed tooth, an enlarged tonsil, a bronchial cough, a ptosis or stasis in the mesentery, a pelvic congestion or organic prolapsis, all record themselves on the lymphatic system that becomes blocked so readily when poisons or toxic products are found within the system.

Enlarged lymph nodes are a true index of some pathological phase at some point within the body.

There is a communication between the lymph vessels of the uterine area and the superficial inguinal nodes. This allows of more ready palpation of the inguinal nodes in a case of diseased uterus. The majority of the lymph vessels of the uterine walls and coverings follow along the

broad ligaments. The aortic nodes eventually collect the lymph. The iliac nodes collect from the cervix, according to the direction of the various lymph vessels from that part. The vagina is lymph-drained by the nodes that lie along the iliac vessels and their branches. The lymph drainage from the bladder is separate from that of the vaginal region until the iliac nodes are reached.

On the sacrum we find a few nodes which collect with the mesenteric nodes the lymph from the muscular coat of the rectum. The lymph vessels follow the course of the haemorrhoidal vessels where nodes are distributed that send efferents to the mesenteric. The sacrum, if tilted in relation to the innominates, may disturb these lymph nodes.

CHAPTER SIX

VACCINES AND SERUMS IN RELATION TO THE LYMPHATIC SYSTEM

We have come to believe that the most effective measure in proving the harmful results of vaccine and serum poisonings is the disturbance produced in the lymphatic system when these poisons are introduced into the circulation. We wish to go on record as being opposed to the use of both vaccines and serums. As osteopathic physicians, we are taught that the body is complete within itself, that there are within the body sufficient secretions to combat diseases if the mechanism is properly adjusted. We believe in the axiom laid down by the founder of Osteopathy, that the "rule of the artery is supreme," etc., that the body is a perfectly complete chemical laboratory wherein the metabolism is balanced so stably that health is maintained when we are lesion free.

The lymphatic system plays a far greater part in the body mechanism than we once thought. No book as yet has been published dealing with the lymphatic system from an angle other than merely that of an anatomical and physiological description. The new method of diagnosing various diseases by palpation of lymphatic nodules is yet to be accepted, but we already have a few believers. The nodes are readily affected, we all know, when poisons are introduced into the system. The mother of any child can see for herself the effects of vaccine poisoning if she will but look for them. She can see the swollen glands in the neck and armpit following a vaccination that "takes." No one need have a more striking demonstration.

In the illustrations shown here the lymphatic vessels and nodes are outlined on the figures to show the areas most commonly affected.

Observe the vaccination sore on the arm lies in a path of direct lymphatic connection with the glands in the axilla. These axillary glands enlarge, and it is with difficulty the arm is raised. In a few days sore throat occurs and the tonsils enlarge. Next we find the neck or cervical glands enlarging and there is usually a complication continuing of blockage and nodular enlargement of the bronchial glands as shown in the accompanying plate,

The swelling of the axillary glands blocks the drainage down the arm and in severe cases the adenitis is followed by the arm and even hand swelling. Cases of gangrene, erysipelas and cellulitis are recorded by authorities such as Osler, Holt, Peebles and others. In Higgins' work on

PLATE XXVI.—Showing the possibility of incipient phthisis through lymphatic blockage, as the result of vaccine or serum poisoning in the axillary region. The bronchial glands are closely related to those of the cervical region.

the "Horrors of Vaccination" repeated cases of suppuration of the lymphatic glands from vaccination are recorded.

Once the lymphatic vessels and nodes are blocked, there is a systemic disturbance that involves the various organs of the body and many patients state that their breakdown and ill health dates from the time of vaccination, or the poisoning of the body through blockage of the lymphatics.

Hundreds of persons have died from this lymphatic poisoning following vaccination. It is a question whether or not a severe vaccine poisoning is not more difficult to clear than a venereal poisoning. The sores following suppuration, after vaccination, are almost impossible to heal in some instances. Arms and legs have been either disabled or amputated in a number of cases.

In the normal person it is with difficulty the lymphatic system is kept clear. There are sufficient toxic products in the system at all times to tax the nodes and vessels. To inject or introduce by scratching in a virus that is in itself a polluted product is to endanger the body in many instances. The insidiousness of intravenous injections is so marked that unless a person is naturally immune, he takes chances of producing an adenitis.

The enlargement of the axillary glands makes it possible for the lymphatic vessels to convey these poisons to the pectoral or breast region. The lumps, found in the breast of a girl or woman after vaccination, are hard to reduce and often persist for years. Who knows but that these lumps, in time, cause cancer?

Numerous cases of phthisis have been recorded following vaccination. The bronchial glands enlarge after the cervical glands, and the blockage soon poisons the lung tissue. A cough results and the first stage of consumption is recorded.

When vaccination is made in the leg, as shown in the plate, there is a nodular swelling in the groin or inguinal region. As these glands are connected with the pelvic lymphatics, we find the ovary on the vaccinated side congested and sensitive. In some cases the inguinal adenitis is so marked, the patient is unable to work for days. It takes time to reduce this lymphatic blockage and the leg is often swollen, and in some instances turns black. The lymphatic blockage may extend down to the foot. Suppuration follows, and a running sore persists for months.

We are now confronted with the blockage of the mesenteric nodes and interference with drainage in the thoracic duct. The plate shows the abdominal nodes and the duct leading up to the neck. Another plate shows the lymphatics of the pelvic region.

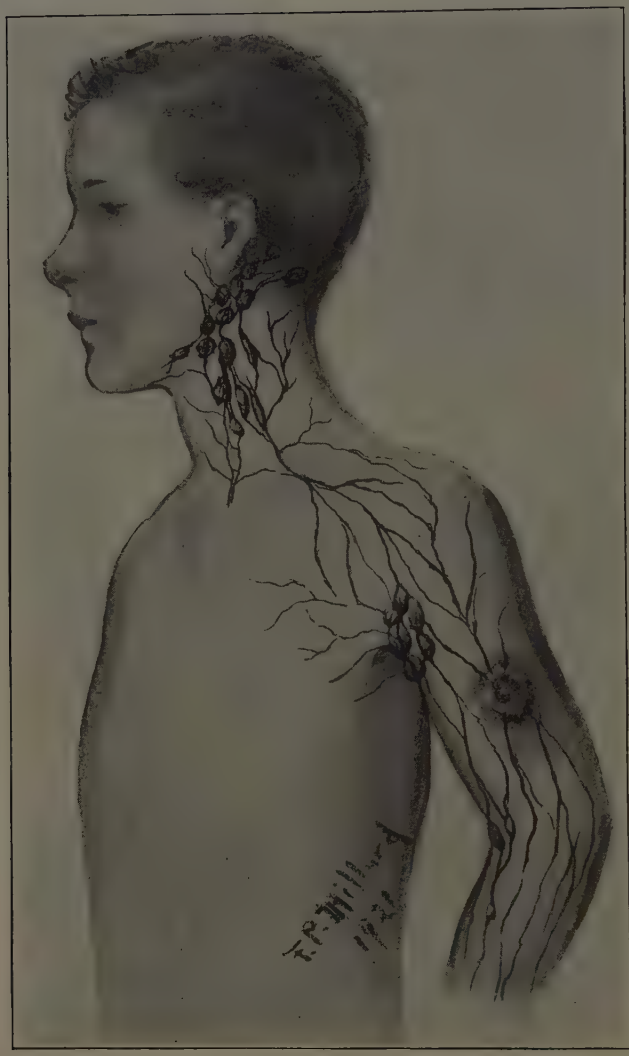

PLATE XXVII.—Lymphatic involvement in vaccination. The possibility of nodular enlargement in the axillary and cervical regions, including the tonsillary area, is plainly shown. The lymphatics of the entire arm may become involved, and spread to the pectoral region.

It is a serious proposition to block the already taxed lymphatic system. If the receptaculum chyli is blocked practically all the abdominal organs are improperly drained. The lymph flow is as essential as the blood flow, and the poisoning of the lymphatic system simply means the poisoning of the entire body tissues and organs.

In dealing with serums we have a blockage or poisoning as striking as in vaccine pollution. I have seen cases in my city that had been given serums and observed a breaking out on the body of ugly boils and sores. A number of cases of sudden deaths following serum injections were recorded this year. Two cases, well known, died within a few minutes after the serum was given. Direct poisoning, more sudden than poison given to kill. Instructions were given, following these sudden deaths, to give all serum injections at home with the patient in bed. Is it possible that a method of this kind is scientific or necessary to restore health?

One case in my city, where a serum was given for acne, resulted in the girl being taken to a hospital where she died a few days later. As osteopaths, we believe in keeping the system clear and the arteries carrying pure blood. We are opposed, as a body of physicians, to the pollution of the blood stream.

A most striking case of direct lymphatic poisoning in a child came to my notice four years ago. The case was the son of a physician, who had been given antitoxin for supposed diphtheria. The nodular enlargement of the cervical glands and tonsils was so great that the neck was almost as large as the head. It was with great difficulty the child's life was saved.

To have a vaccination scar is a reflection on the high intelligence of a civilized people. A scar following a solicited vaccination signifies loyalty to medical superstition. A scar from forced vaccination is a brand, and is a mark of medical tyranny and despotism. I would not be vaccinated and take the risk of complications for a $10,000 check. My children have never been vaccinated and I trust never will. So many mothers are frightened when an epidemic scare is on, they simply give in and have their children vaccinated for fear they might be kept away from school. I would rather keep my children out until the scare is over, than to submit them to the dangers of lymphatic poisoning. If mothers of the land would take a determined stand, we could make compulsory vaccination a thing of the past in a few years.

The serum theory, presented by Medical Doctors, claiming that it is a scientific treatment, induces adults all over the land to take serums for almost every complaint. I am of the opinion that there will be a great

PLATE XXVIII.—We find that vaccination on the thigh or just above the knee causes enlargement and sometimes suppuration of the inguinal nodes. As the ovary and pelvic regions are in close proximity, sterility may result where poisoning has affected the glands and tissues of that region.

reaction some of these days, and just as the best specialists are not performing many tonsillectomies, so the best physicians will not long give serums for every complaint. We cannot afford to block the system unduly. We want instead to find a way of clearing the system of poisons.

In treating the lymphatics we must work with one point in view; that of frecing the lymphatic channels and ducts first at their emptying point in the neck, and then clear the lymphatic vessels and nodes at distant points. First the thoracic area and then the abdominal and pelvic areas. The extremities come last.

The lymphatic vessels and nodes must be reached through the vasomotor centers that control them directly or indirectly. We must get combined effect on the vascular system and lymphatics. No superficial treatment will be of any great value. We must reach the deeper or main vessels and ducts. The intercostals may be reached by thoracic adjustment, and the receptaculum chyli and its tributaries by the splanchnic and mesenteric vasomotors. If you clear the lymphatic system you will clear the vascular at the same time.

Six swollen lymphatic glands in certain areas will make one ill. A dozen will put you on your back, and fifty vital glands blocked may cause death.

Let us work together as osteopaths to clear the system of poisons, and tell the people of the dangers of vaccines and serums.

VACCINATION AND THE LYMPHATICS

C. C. Reid, M. D., D. O., Denver, Colorado

Vaccination as a method of preventing smallpox has been universally adopted by the medical profession. There are very few who openly oppose it. Those who do oppose it as a rule keep very quiet for fear of coming under professional disapprobation. There are not many people who have the "guts" to stand up against public sentiment and the general professional trend.

Not many physicians now dare to speak out in open meeting against the universal trend toward state medicine. Yet, not many years past we had the autocracy of state religion which required many years and much suffering to throw off. We seem now to be ready to put on state medicine, which will probably be more galling than state religion, after it is thoroughly established.

During the last smallpox epidemic and the resulting scare, a very large percentage of the people rushed to be vaccinated. Personally,

I have no way to prove or disprove the theory of vaccination. Since it has been adopted almost universally by the medical profession and through their educational propaganda, vaccination has been accepted largely by humanity as a prevention of smallpox and people desire to have it done.

Recently I had occasion to vaccinate many of my patrons. I was interested in watching the results of the vaccination on a great many of them whom it was my opportunity to observe. Some were vaccinated on the arm and others on the leg. In the arm cases, where it took, there was an enlargement and swelling of the lymphatic glands in the axilla. Those that took on the leg, showed a soreness and thickening of the gland in the groin on the side of the vaccinated leg.

Many of them had large pustules; were quite sick with fever, ranging from 101 to 103, went to bed for from one to three days, and were more or less prostrated for something near a week.

For this article, the interesting phenomenon was the effect on the lymphatic glands. You might turn it the other way and say the effect of the lymphatic glands on the vaccination. The functioning of the lymph glands showed that there was a real poisoning or infection of that part of the body on which the vaccination was taking. The tendency of that infection was to spread through the system. The function of the lymph was to counteract poison and head off infection.

The lymphatic glands in the groin on the side vaccinated had an extremely hard proposition to prevent the infection from spreading in some instances throughout the system. In these cases if it were not for the lymph keeping the gateway closed against a large per cent. of the infection, the system receiving the whole bolt at once would very likely be overwhelmed.

I have not had a chance to observe, but I believe a woman who has had her breast removed, along with which the axillary glands are frequently removed in such operations, if she were vaccinated on that side afterward, the consequences of the vaccination on her system would be considerably more serious as a result of the absence of the lymphatic glands. Also, in cases where the glands of the axilla have been removed the patient would likely suffer more in a systemic way when vaccinated on the leg.

Most of these cases had a real acute adenitis, as shown by the enlargement and swelling, soreness in the limb, and the pain in the glands of the axilla or the groin, according to the location of the vaccination. The tonsils and the lymphoid tissue making up Waldeyer's ring about the throat have the same function very largely as that of the lymphatic

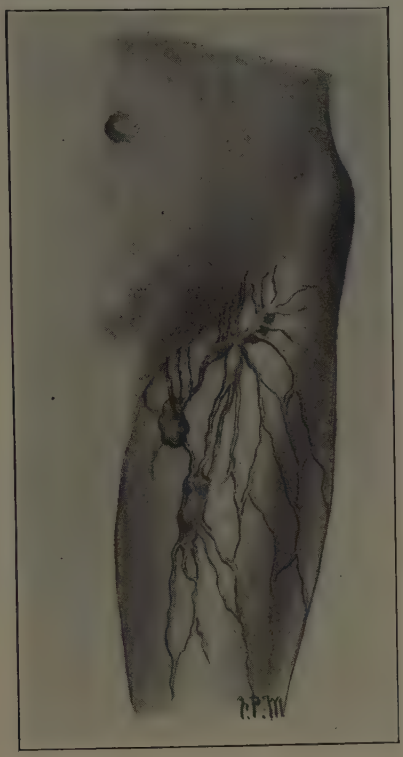

PLATE XXIX.

Enlarged nodes as result of vaccination.

glands. When there is a toxin or infection, as there frequently is in the nose and throat, some portion of Waldeyer's ring becomes thickened, enlarged and sore. If the reaction is so great as to set up an acute condition, there will be pain, redness and swelling sometimes extending from the tonsils into the tissues of the neck and involving practically the whole of Waldeyer's ring. Repeated inflammation of this kind causes enlargement of the faucial tonsils and the pharyngeal tonsils known as adenoids.

Operations in this region of course should be conservative because of the tendency to destroy the integrity of Waldeyer's ring. Every evidence points to the fact that the structures composing this ring are placed about the throat for a protection against infections and toxins in this region.

It was noted that many of the patients developed sore throat with more or less swelling about Waldeyer's ring. Those who had tonsils showed more or less enlargement there. Those who did not have tonsils were not exempt from the sore throat. The effect of the vaccination upon the lymphatics was to cause acute inflammation resulting in more or less chronic conditions causing the overworking of the lymph glands.

EDWIN MARTIN DOWNING, D. O.
York, Pa.

CHAPTER SEVEN

THE ORIGIN AND FUNCTION OF THE LYMPHATIC SYSTEM

EDWIN MARTIN DOWNING, D. O., York, Pa.

"Let us go deeper into the study of the life-saving powers of the lymphatics."

"Possibly less is known of the lymphatics than of any other division of the life-sustaining machinery of man."

"We lay much stress on the uses of blood and the powers of the nerves, but have we any evidence that they are of more vital importance than the lymphatics? If not, let us halt at this universal system of irrigation, and study its great uses in sustaining animal life."

These quotations from "The Philosophy and Mechanical Principles of Osteopathy" are given to show the importance in Dr. Still's mind of a thorough understanding of lymph and the lymphatic system. Those who have followed his teachings and writings know that Dr. Still always urged this point.

Any considerable attention to the subject will show the need of an intimate knowledge of the origin, properties and movements of the lymph, of the structure of the lymph vessels and glands, and of the relation of the entire lymphatic system (including the lacteals) to the metabolic processes and the general economy of the body.

Importance of The Lymphatics

In support of this statement I submit the following propositions:

1. All of the processes of tissue nutrition and repair are dependent upon the lymph.

2. Since the blood does not come into direct contact with the tissue cells (except in one organ—the spleen), one of the main functions of blood circulation is to supply and renew the lymph to all tissues. As has been tersely said, "the blood feeds the lymph, and the lymph feeds the cells."

3. The excretion of the cells, the waste products of metabolism, are carried by the lymph back into the blood-stream, for elimination through the several emunctories.

4. Through the lymph channels metastasis frequently occurs, especially of malignant tumor cells.

5. The lymph glands or nodes afford (through their product, the phagocytes) a very considerable protection against various forms of infection.

6. By the use of consistently osteopathic procedures, manipulative and otherwise, the lymph currents may be made to serve as an exceedingly great factor in the abortion of and the recovery from a wide range of diseases.

The practical value to the physician of a study of the lymphatic system lies in the last statement given above. It is true that in the mechanism of the recovery from disease the lymphatics automatically or functionally play an important part, and the osteopath usually increases their functional activity even though he does not realize how he accomplishes it. If, however, he can assist nature's reparative efforts by controlling and utilizing the forces which are contained in that all-pervasive fluid, the lymph, he is so much the better able to cope with disease.

It will be necessary to dwell briefly on the anatomy of the lymph vessels and glands. To obtain a fair conception of the relation of the lymphatic system with the blood circulation, the following from Gage will be of assistance:

"A tolerably correct pictorial idea of the entire vascular system may be formed by considering the blood-vascular part as made up of a great tree, the heart forming a short trunk, and the arteries, veins and capillaries the branches; but there is present the untree-like character of the direct union of the terminal twigs of the arteries and veins, that is, the venous and arterial capillaries are continuous. The lymphatic system may then be represented by two vines of unequal size, but which together follow all the blood vessels to their ultimate ramifications, and in many places even send minute twigs beyond them. The analogy with a vine is further borne out by the lymphatic vessels, as they remain of a more uniform diameter than the blood vessels; and finally, the terminal twigs, like those of a real vine, end freely or blindly, often in slight expansions like leaves, thus forming a marked contrast with the terminal twigs of arteries and veins, which cannot properly be said to terminate at all. In a word, the blood-vascular system forms a complete circle or circuit in itself, while the lymph-vascular system joins the blood-vascular system at its central or trunk end, but ends blindly at the periphery."

One might with propriety carry out Gage's picture by imagining the tree and vine enclosed in a huge bag. In that case the terminal twigs and leaves and tendrils of the vine would not only fill all of the space between the tree branches, but would push out into the substance of the bag as well. For lymph ducts penetrate nearly all the structures, including the corium (beyond which the lymph passes into the rete Malpighii), and many perivascular spaces and other interstices are filled with loose connective tissue which is permeated with lymph.

The Volume of Lymph

The total volume of the lymph is consequently enormous. Experimenters, through different methods of determination and different conditions of the body, have variously estimated the amount of lymph to be from 1-6 up to 1-3 of the total body volume. The volume of the blood ranges from 1-15 to 1-11* of that of the body. If from these several estimates we use as a mean ratio 1-4 to represent the volume of the lymph, and 1-12 that of the blood, we find that there is about three times as much lymph as blood. Even if it performed no important function, the mere mass or bulk of this fluid would compel us to view it as having no small influence in the economy of the body. And since its mission is so vital to all the structures, we cannot regard it lightly.

This immense body of fluid constitutes a medium of exchange so universal that man has been described, not inaptly, as an aquatic animal. Every cell is bathed in lymph. Every cell depends upon the lymph for nourishment. Every cell is afforded drainage by means of the lymph. As Byron Robinson says, the lymph performs an import and export duty; carries on a commerce with every other tissue.

Development of Lymphatics

A series of studies made on pig embryos by Dr. Florence R. Sabin of Johns Hopkins University demonstrated the fact that the lymphatic vessels are developed from the veins. Her highly interesting reports of these studies are embodied in three papers contributed to the American Journal of Anatomy. Injection of large numbers of embryos in various stages of development† showed that the lymphatics begin to bud out from the veins at four points—two in the veins of the neck, and later two in the inguinal region. As authority for the statement that the lymphatics do not develop as a separate system, but are an outgrowth or appendage of the venous system, I quote Dr. Sabin:

"The proof that the lymphatic ducts bud off from the veins is as follows: It has been established that the ducts invade the skin from four points, two anterior and two posterior, and that the growth is from center to periphery. Starting from the time when the ducts have completely covered the skin, every stage has been followed backward until

*The results of 74 experiments by the carbon monoxid method showed only five per cent. or 1-20 of the body weight to be the actual weight of the blood.

†Dr. Sabin says: "The development of the lymphatic system was found in this way. We have an abundant supply of pig embryos at the Anatomical Laboratory. Every day large numbers of embryos of all sizes from under 10 mm. upwards are brought to the laboratory. Moreover, we are so near the abbatoir that the embryos are often brought with the heart still beating. It is essential in injecting lymphatics to have fresh embryos, for after an embryo is once thoroughly cold it is impossible to get good injections. The best results are always obtained while the heart is still beating."

PLATE XXX.—The principal nerve tracts are shown including some of the cranial nerves. We have drawn in a few lymph nodes to show the relation of the nodes to the nerve branches. The thoracic duct and receptaculum chyli have been drawn upward a few spinal segments to more clearly illustrate the solar plexus.

the ducts are extremely small and extend only a short distance from the vein. In this stage the opening into the vein is just as perfect as in the later stages. Moreover, previous to the stage in which this bud connected with the vein is found, there is no trace of a lymphatic duct or sac, as there would be if the sac formed first and subsequently joined the vein."

Anatomy of the Lymphatic System

For anatomical distinction three sets of lymphatic vessels and glands are noted—the ectal or superficial, the ental or deep, and the visceral or those of the various organs. In general, the superficial or subcutaneous vessels follow the veins, while the deep or subaponeurotic set follows the arteries. In all of them the course of the lymph is the same as the venous blood-flow, from periphery to center—though in emergencies this may be reversed (through anastomotic collateral vessels) so as to afford cell nourishment and drainage.

The lymphatic vessels are richer in anastomoses than are the veins. Not only do the vessels of the different sets anastomose freely with others of the same set, but the superficial and deep vessels also form frequent anastomoses. The vessels are furnished with valves at short intervals. The valves are in pairs, and are crescent-shaped or semilunar. As the lymph current has feebler propulsive power than that of the blood, the valves are more closely placed than those of the veins. From the hand to the axilla, for instance, there are from sixty to eighty pairs of valves.

While abundant anastomosis is provided, and the vessels frequently divide and subdivide only to converge again, the contents of all of the vessels pass through one or more nodes or glands before reaching the terminal collecting trunks. Further allusion will be made to this in speaking of the functions of the glands.

There are from 500 to 600 of these lymphatic nodes or glands in the human body. They are small bean-like nodules developed from a plexus or network of the vessels, and are usually surrounded by loose connective tissue. In childhood they are reddish-gray in color, and on section are quite translucent; in advanced life they generally become atrophied and much darker in color. They occur singly in some positions (solitary glands), but generally in groups or chains. They are so placed—in loose connective tissue and in the flexures of joints—as to be freely movable. In consequence they admit of considerable enlargement before occasioning pressure symptoms.

The glands usually receive two or more afferent vessels. Generally before entering the gland each vessel breaks up into several smaller ones. The efferent vessels are larger and fewer in number. From the

PLATE XXXI. The receptaculum chyli and mesenteric nodes. The intercostal chain of nodes are drawn large to show their position. The lower six on either side usually connect with the receptaculum. The upper six with the duct terminals. (Not connected in this plate.)

ease with which they may be observed, the cervical, axillary and inguinal glands are oftenest noted. From the osteopathic standpoint, the cervical glands receive the most serious consideration, but those of the axilla and groin may by no means be ignored. A knowledge of the relations of the deep and superficial cervical glands, their afferent and efferent vessels, and the different structures drained by the different glands, is of the utmost importance to the osteopath.

Lymphoid or adenoid tissue, similar in structure and function to the nodes, occurs in many situations. It has not the organized glandular form of the nodes, but consists of a fine network of anastomosing cells. Where this tissue is clearly defined it is spoken of as a follicle. In other places it is quite diffuse. It is abundantly found in the diffuse form in the entire digestive tract, while in the follicular aggregations it occurs in the tonsils and in the small intestines. In the latter location the follicles are known as Peyers patches or agminated glands.

Lymphatics of the Intestines

The lymphatics of the small intestines, while structurally and functionally identical with the rest of the system, possess the additional function of absorbing the chyle through the intestinal stomata. There are really two distinct sets of intestinal vessels. Those of the mucosa absorb and convey the chyle, and they alone can be correctly spoken of as the absorbent, lacteal or chyliferous vessels. Those of the muscularis convey lymph only. Sappey holds that only the vessels of the intestinal villi absorb chyle, so that they are the only true lacteal vessels. No such distinction is usually made, it being the custom to speak of the vessels which have their origin in the small intestines as lacteals. Except during digestion, the lacteals carry lymph precisely as do the other lymphatic vessels.*

The Nerve Supply

Before taking up the physiology and pathology of the lymphatic system, we must inquire as to its nerve supply. Until recently it was thought that the flow of the lymph was due solely to mechanical forces. These are respiratory movements, intra-abdominal pressure, muscular contraction, the difference in pressure between the lymph capillaries

*Dr. Sabin thus summarizes the development of the lymphatic system: "The lymphatic system is a modification of the circulatory system, dependent both in its origin, and in large measure in its development, on the blood vessels. It returns to the vascular system the fluid exuded into the tissue spaces from the blood vessels. Speaking more generally, it is a system of absorbents. The lymph glands, which develop by the increase of connective tissue, around the plexuses of ducts, come later; they occur only in birds and mammals, and do not begin to develop in mammalian embryos until the ducts or capillaries they drain are well formed."

and the terminal ducts (pressure at the opening of the ducts being very low or even negative), the inherent contractility of the vessel walls, VIS A TERGO, etc. The thirteenth edition of Gray's Anatomy contains the following statement:

"The lymphatics are supplied by nutrient vessels, which are distributed to their outer and middle coats; but no nerves have at present been traced into them." In the latest edition the last clause is replaced by the following: "and here also have been traced many non-medulated nerve-fibres in the form of a fine plexus of fibrils." Concerning the glands, the following appears in Gray: "Little is known of the nerves, though Kolliker describes some fine nervous filaments passing into the hilum."

Some modern authorities still ignore the presence of nerves in the lymph vessels and glands. Kirkes mentions evidence of sympathetic (vasomotor) nerves in the thoracic duct, but ascribes the flow of lymph to other than nervous impulses. Gage, in his splendid monograph on The Lymphatic System, makes no reference to the nerves of the vessels. I have searched in vain for allusion to the nerve supply of the lymphatics in the works of several writers on the pathology of the glands. Hall says: "The flow of lymph seems to be without direct nervous control."

On the other hand, Landois says: "The nervous system has a direct influence upon the movement of lymph through innervation of the muscles of the lymphatics. In addition there are still other special effects of the nerves upon the absorptive activity of the lymphatic radicles." Landois also mentions Golz's experiment, which was as follows. He injected a dilute salt solution into the subcutaneous lymph spaces, and found that it was readily absorbed. The absorption was retarded by division of the nerves to the extremities, and the destruction of the central nervous system caused the solution to remain unabsorbed.

Delamere, in "The Lymphatics" (probably the most complete work on the lymphatic system that is published in English), states that the walls of the lymphatic trunks are rich in nerves, and supports the statement by quoting various investigators. For instance, Dogiel and De Timofejewsky saw nerve filaments surrounding the lymphatics of the cord, the prepuce and the gall bladder. Smirnow found both motor and sensory nerve-endings in the lymphatics of the cord. Quenu and Darier have seen fibers forming an adventitious plexus in the thoracic duct of the dog. Kytmanoff also is quoted. He believes, from researches conducted according to Ehrlich's method, that while the nerves of the lymphatics are formed chiefly by the fibers of Remak, they contain some fibers with myelin. He describes adventitious, supra-muscular

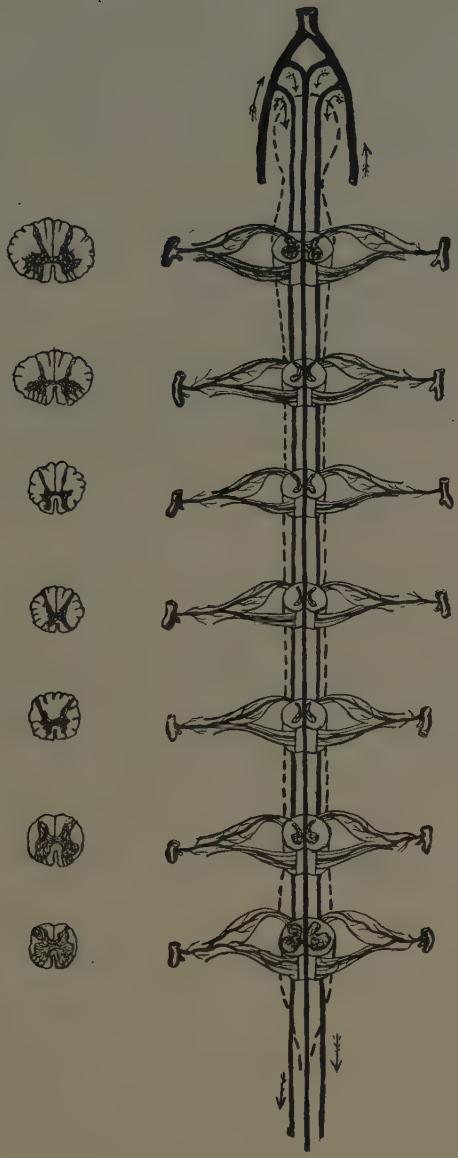

PLATE XXXII. Without proper lymph drainage the spinal cord and membranes would lack in their functions. The lymph flow must be kept normal as well as the vascularization of the cord.

and sub-endothelial plexuses. There are motor terminations in the muscular fibers, while the terminations of the sensory nerves are in the external and middle coats of the vessels.

Hazzard in his Practice of Osteopathy quotes Dr. Still's views on the innervation of the lymphatic system and especially of the thoracic duct, with particular reference to the causation of obesity. He says: "Dr. Still points out spinal lesion to the full length of the thoracic duct, acting through the various spinal sympathetic connections, splanchnics, etc. He mentions especially lesion at the 4th dorsal, which he calls a center for nutrition, and at the 7th cervical, opposite which the duct ends. He has called attention to lesion in the upper dorsal region, just below the cervical, giving rise to the growth of a fleshy cushion, a condition of affairs that seems to influence the lymphatic system and cause a deposition of fat. He also works high in the cervical region, opposite the transverse processes of the vertebrae, for nerves controlling the caliber of the duct."

In his last book, "The Abdominal and Pelvic Brain," Byron Robinson employed the following language to show the vasomotor control of the lymphatics: "The functioning of the tractus lymphaticus (sensation, peristalsis, absorption and secretion) is controlled by the nervus vasomotorius (sympathetic). The tractus lymphaticus is richly supplied by a plexiform, nodular network, a fenestrated anastomosed meshwork of the nervus vasomotorius which controls its physiology."

In view of the findings of many investigators, the authority of Dr. Still (which is no doubt somewhat empirical, being based probably on clinical experience), and the positive assertion of so great an anatomist as Robinson, we are justified in accepting the vasomotor control of the lymph vessels, subject, however, to the mechanical influences alluded to above.

The Movement of the Lymph

Let us revert to the general movement of lymph, beginning with its transudation through the walls of the blood capillaries. At the outset we are confronted by conflicting views of the origin of the lymph plasma. By some it is thought to be solely an infiltration of blood plasma by osmosis through the capillary walls. A larger number believe it contains in addition a secretion of the capillary endothelium—a product of cellular activity. The fact that it differs in chemical composition from the blood plasma seems to prove the latter point to be correct. It is a slightly viscid, alkaline fluid, nearly colorless and odorless, varying somewhat in different locations, and carrying variable numbers of leuco-

cytes. The leucocytes are regarded as casual guests of the lymph, and not an essential part of it.

Passing into the intercellular lymph spaces beyond the capillaries, bathing all the cells and supplying them with the nutrient properties it contains, and receiving their excretions, the lymph begins its journey back to the blood-stream. Laden with katabolic products, it enters the lymph capillaries, thence passes into the larger vessels, and is carried along to a lymphatic node or so-called gland. It is in these nodes that some of the leucocytes (at least those known as lymphocytes) are generated. The progress of the lymph is somewhat retarded in passing through the nodes, and foreign substances, whether living germs or inert matter, are caught and imprisoned. This accounts for the tenderness and hypertrophy of the nodes in so many pathological conditions.

Emerging from the gland, the lymph passes on—generally through several glands—until it reaches the lymphatic duct on the right or the thoracic duct on the left. Through one or the other of these terminal vessels it enters the blood-stream at the junction of the subclavian and internal jugular veins. Before again traversing the arteries, the lymph is modified by entering the pulmonary circulation, where it is charged with oxygen.

While we must not overlook the lacteals, which during digestion pour the chyle into the thoracic duct, with that exception we see in the lymphatics a system of closed ducts. In this respect the lymphatic system as a whole resembles the spleen and other ductless glands.

This inadequate, imperfect and necessarily brief sketch of the lymphatic system is presented in order that the salient facts be before the mind's eye. Much is omitted that could profitably have been introduced did the limitations of this chapter permit. The composition of the lymph and chyle, a fuller discussion of the lacteals, the question of selectivity of the absorptive epithelium, the structure of the walls of the vessels and the nodes, the evolution and degeneration of the leucocytes and other cellular casual guests of the lymph—these and many other points could be dwelt upon, all having a direct bearing on our main subject. I trust that the readers' interest will have been sufficiently aroused to induce them to pursue the study further.

Functions of the Nodes

An important function of the lymphatic nodes has been only touched upon. I refer to the formation within them of lymph-cells. Strictly speaking, the lymph nodes are not glands in the ordinary meaning of the term, but they may be classed with the organs known as ductless

glands—those forming an "internal secretion." In the case of the lymphatic glands the internal secretion is the lymphocytes. That these are most important factors in phagocytosis is seen by the large number of pathological conditions in which the glands become inflamed and swollen. Who has not seen inguinal glands enlarged and tender from an inflamed corn, or axillary glands exquisitely painful from a boil on the forearm? These simple forms of lymphangitis are quickly abated with the subsidence of the original inflammation. It is amply proven that in these, as well as in graver conditions, every measure which aids the formation and circulation of lymph helps to relieve the inflammatory state.

Lymph and the Endocrines

All of the foregoing portion of this chapter was written several years ago, and the author sees no occasion to change or revise it thus far. He desires, however, to direct attention to the next two paragraphs, which were also written at the same time:

"Another function of the lymphatic system which gives it a peculiar interest to the student of somatology is that it affords a highway for the transportation of the internal secretions of the other ductless glands. We know comparatively little of the real office of the pituitary body, the pineal gland, the thyroid body, the spleen, the suprarenal capsules. Enough has been demonstrated, however, by extirpation, by injection of glandular extracts, by transplantation, and by study of diseases in which the function of a gland is impaired or suspended, to prove that these ductless glands profoundly affect metabolism through the utilization of their secretions by other parts of the organism. How quickly then will the equilibrium be disturbed by any interference with the free distribution of the lymph which bears these secretions in its currents.

"Again, may it not be true that in diseases of the ductless glands a great help toward establishing a cure is to be found in agencies that tend to increase lymph pressure and flow? For example, take Graves' disease and the serious symptoms it presents (tachycardia, digestive disorders, extreme prostration, exophthalmos, tremors, etc.) and the well-demonstrated fact that osteopathic treatment causes marked improvement. Can we show that correction of the lesions which are found in these cases directly produces the benefit manifested? Not always, I believe. May it not then be reasonably assumed that those symptoms at least which are referable to the auto-intoxication caused by a modified distribution of the thyroid's internal secretion are due in part to failure of the lymph to properly transport the secretion? In such event, may not the treatment administered to correct the anatomical faults give the lymph the needed impetus?"

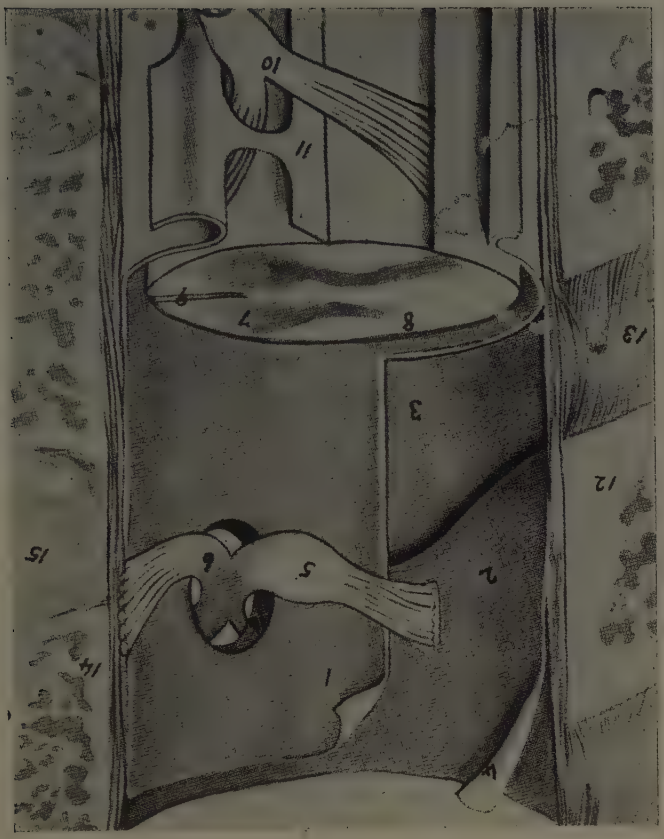

PLATE XXXIII.—"Intramural" (within the walls). 1, Dura Mater; 2, 3, and 4, Periosteal lining; 5, Posterior ganglion; 6, Anterior nerve roots; 7, Anterior horn; 8, Posterior horn; 9, Anterior median fissure; 10, Union of anterior and posterior spinal nerve roots, 11, Ligamentum denticulatum; 12, Spinous process; 13, Ligament; 14, Body of vertebra; 15. Disc between vertebrae. The cerebrospinal fluid contained in this area is a modified form of lymph. Normal nerve tone depends on good lymph drainage.

The above suggestions, though made empirically, seem to be justified by recent research into the functions and relations of the ductless glands. Again quoting the axiom that the blood feeds the lymph and the lymph feeds the cells, we must see the supreme importance of free lymphatic activity.

In this connection permit a further quotation:

"Now that we know the important relation existing between the various secretory glands, and among these the ovary and the testicle are not the least important, we can understand that in dementia precox menstruation is delayed or that there is sexual precocity, for menstruation is a pluriglandular cyclic process. We can understand sexual excesses, vagaries and perversions. It is easily understood why the symptoms are brought out or accentuated by menstruation or brought on by pregnancy, repeated pregnancy, or by miscarriage. Hence DEMENTIA PRECOX IS A SERIOUS AND EXTREME TYPE OF ENDOCRINE ABERRATION OR ABNORMALITY EVIDENCING ITS PRESENCE BY PSYCHIC RATHER THAN SOMATIC ALTERATIONS. So as we delve into one mental aberration after another, the internal secretory glands seem to be more and more related to conditions characterized by psychic manifestations.

"The physical and mental development of the individual are dependent on the action and interaction of the ductless glands. The nutrition of the body, of the mind and of the sex organs, as we are learning more and more, are dependent on the trophic stimuli of the ductless gland system. Long before the trophic relation between the various glands and the ovary is evidenced by menstruation and development of the secondary sex characteristics, these glands are concerned with the body growth.

"The physical and mental development of a growing child is dependent upon the activity of the hypophysis gland and particularly the thyroid gland. Bony growth is of course related to calcium metabolism and here the thymus and the parathyroids and adrenals are of importance. The thymus and the parathyroid glands are particularly concerned with calcium metabolism and, to this degree and probably in ways which we do not yet understand, they are intimately associated therefore with bony growth and the development of the skeleton. We do know that hypothymism causes short bones, thin bones, fragile bones. We know the lack of physical and mental development in cretinism. We know that dwarfs may also be due to an underactivity of the hypophysis gland."*

I would direct attention to that common affection of the cervical nodes, tubercular adenitis. So frequently does it occur in childhood

*Bandler: The Endocrines. W. B. Saunders Co., 1920.

that one writer says 96 per cent of all children become infected at one time or another with tuberculosis of the cervical lymphatics. The fact that so often a tubercular gland or group of glands will remain quiescent for a long period may lead to the belief that there exists a simple adenitis, and local treatment may light up the tubercular process, with very bad results. If there is any likelihood whatever of tubercular infection all work in the cervical region should be done in the most guarded manner, to avoid causing inflammation which may terminate in suppuration. Glands which have softened can be dealt with only surgically. The general treatment of the patient in all such tuberculous cases is the same as in pulmonary and other forms of tuberculosis—outdoor life, an abundance of nutritious, easily digested food, together with appropriate osteopathic treatment.

Transubstantiation in the Lymph-Stream

In searching for the elusive, mysterious seat of that "transubstantiation" whereby the assimilated portion of the ingested bread becomes the actual body; in seeking to uncover that stage of the anabolic process at which protein is transformed into protoplasm, it is through the lymph-stream that we shall, if ever, discover the ultimate metamorphosis.

The Lymph and Nutrition

To the inquiring mind countless channels of thought are opened by questioning the influence of lymph formation and flow in relation to many diseases. How can we direct nutrition to impoverished cells? How can we through the lymphatics reach and stimulate the emunctories and accelerate excretions? If we learn to accomplish these and other results, in some measure, then is this study not wholly in vain, and it behooves us to hearken to Dr. Still as he bids us to "go deeper." In the present chapter I can do little more than indicate some possibilities. The questions may be taken up in a later article, but in the meantime each must elaborate the subject for himself.

The Commissary Department

The lymphatic system is as necessary to the body as the quartermaster department is to an army. The army may have the finest uniforms, the best ammunition, and all the accompanying impedimenta, but if provisions are not forthcoming there is speedy disintegration. The whole mechanism is upset. So with the body. Without the continual supply of lymph to all the parts we would have wasting, disease, and death. Every living cell must have its continual supply of nutrition, or it will cease functioning.

When the army is going through a battle the supplies must still keep coming, in greater abundance and with greater efficiency than before. If the depletion in the ranks is too great, sometimes the deficiency in the fighting force is filled by members of the quartermaster corps, who fall into the breach and are quickly developed into fighting men. They may not perform their new duties so well as the trained regulars, but after a time it would be almost impossible to distinguish them from the veterans.

The Lymph in Orthopedic Surgery

Here we can draw a very fair comparison between an army and the body. The lymph plays an all-important part in the metabolic processes, through its double role of nutritional supply and filtering process in the nodes, but in regeneration of tissue it takes on a third function, namely, cell forming. This function is very necessary in repair cases, following operation, and so must be of great interest to the orthopedic surgeon, who looks for the formation of new tissues and structures. Here it is that the lymph throws its cells into the breach to fill up the gaps in the ranks of the regulars.

Take the simple operation of subcutaneous tenotomy, so necessary in many cases of talipes, particularly those of the equinus types. It is not unusual in the author's experience to sever the tendo Achillis without the external loss of two drops of blood, by making an incision parallel to the tendon and turning the knife so as to cut squarely across the tendon. What follows? There is rapid exudation of lymph from both cut ends, and new cells are formed to fill the interspace, though it be an inch or more in extent. Within eight weeks new tendon and sheath fill the gap. The external wound is scarcely visible and the new portion of the tendon is fully as strong as the old.

In any process of regeneration there must be the regular line tissue which leads in the action. We look back to the embryo, even back to the blastula and gastrula stages in the development of any animal, and we find that development took place in regular lines and layers of cells, uniform and homogeneous. Later, some of these cells, or groups of cells, were cut off from the rest of the regular layer, and then began to take on new characteristics. They became specialized, and lost all apparent connection with their primitive brethren. In the main, however, the greater part of these first cells developed, and in the mature human we find them divided into two great classes, epithelium and endothelium. The epithelium refers to the layers of cells which line all systems which open into the exterior, such as the skin, digestive tract, respiratory tract, and the uro-genital tract. Endothelium means the

layers of cells which line all closed systems—blood vessels, peritoneum, pleura, etc. These are in reality primitive cells, and it is these cells which are most easily replaced.

In regeneration, then, the organs which are most quickly repaired must necessarily be those which have epithelial or endothelial connections. A wound in the skin, for example, if it heals by first intention, will very quickly be restored to normal. The epithelial cells in the immediate vicinity react with astonishing rapidity. An extra supply of lymph is rushed in, and lymphocytes are ingested in great quantities by the epithelial warriors. They don't even wait to take food from the cells; they take cells and all, and in their increased metabolic activity transfer everything into their own protoplasm. Thus active karyokinesis is established, the epithelial cells become spindle-shaped as they go on developing, fibroblasts are formed, and soon we find that these primitive cells have made themselves into the next number in the series, connective tissue. Some authors say that connective tissue is the most primitive, in that it never develops very highly, but from an embryological standpoint, surely, epithelial tissue has every claim. The exception, of course, is nervous tissue, which comes directly from the ectodermal layer, but it goes through so much differentiation, this master tissue, that it is hardly just to classify it with epithelium.

This newly-formed tissue, unless it is very superficial, will not become exactly like the old structure, but a cicatrix will be left, composed of white fibrous connective tissue, formed from the epithelial fibroblasts. Even before this process is finished, to illustrate how important is nutrition, the lymph capillaries in the region surrounding the cicatrix bring increased pressure to bear by dilating with their fluid, and actually push their endothelial linings through the hard, heterogeneous mass in order to rush in supplies to the newly-formed member. The blood vessels, of course, are doing likewise, because there is always harmony of action between the blood and lymphatic circulation.

When big gaps are made in structures, as in the case of an operation when part of a structure is removed, the parenchymatous cells are not regenerated. Specialization has gone on too far for new cells to be regenerated from primitive tissue. The veterans have been destroyed. They cannot be replaced. The space is filled with a debris of blood cells, epithelial and endothelial cells, and a great deal of lymph. At first there is only a mass of material, an indistinguishable conglomeration. Gradually, however, the forces of nature begin to pick and choose, the chaff is separated from the wheat, and organization begins to come out of chaos. The live cells ingest food and undergo karyokinesis. The

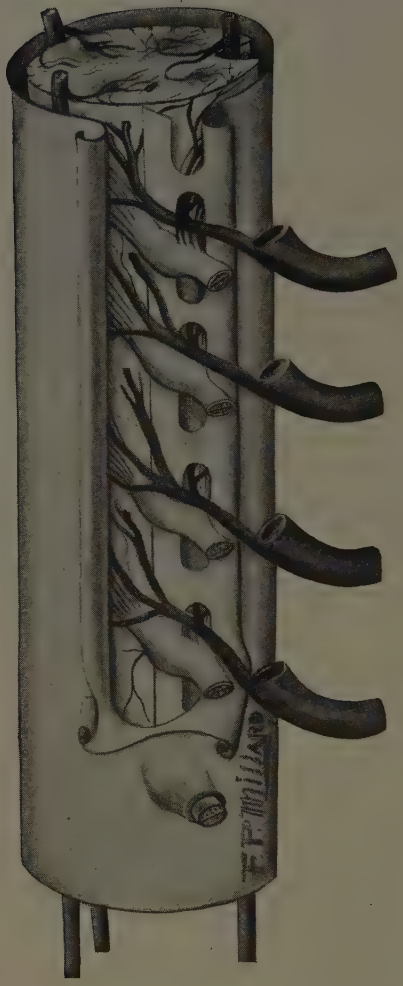

PLATE XXXIV. Several sections of the cord are shown to bring out the idea of the circulation in the cord segments. The lymph vessels and spaces follow the course of the blood vessels and capillaries. Perfect lymph drainage helps to insure normal nerve stability.

lymph stream carries off the products of metabolism and other waste and poisons collected in this region, connective tissue is formed, and soon the regeneration has taken place, the structure is once more complete. In tissues where great specialization has not taken place, as in tendon, cartilage and bone, practically complete restoration of the original tissue is the result, providing that the germinal epithelial linings (i. e. periosteum and perichondrium) have been preserved. In organs where great specialization has taken place, as in the kidney, restoration of the parenchyma is not effected.

To Stimulate Lymph Flow

Regarding the flow Kirkes says: "The flow of lymph may be increased by increasing the capillary pressure. This may be done by injecting a large amount of fluid into the circulation, or by the injection of such substances as sugar and salt into the blood." Various observers hold that the receptaculum chyli undergoes rhythmical contractions, in which case we may conclude that the pressure and flow of lymph are greatly increased after the ingestion of food. Some drugs (as curare) increase the flow of lymph, and it can be done locally by ligation of the veins. Bier's constriction method of inducing local passive hyperemia deserves mention. However, with none of these means have we at present any concern.

Among the noteworthy methods are: (1) Deep breathing. With each inspiration the flow of blood through the innominate veins causes a suction at the openings of the thoracic and right lymphatic ducts. This may be augmented by intra-abdominal pressure if the abdomen be forcibly drawn in. (2) Manipulation of the extremities by flexion of the joints and compression of muscles. This may be either active or passive. (3) Raising intra-abdominal blood-pressure by direct work over the abdomen and by compressing the ribs. (4) Restoring normal tone to the diaphragm if it is prolapsed or relaxed. Dr. Still suggests that such prolapse may cause embarrassment to the thoracic duct. Hazzard elaborates this suggestion in a chapter in his Practice entitled "An Osteopathic Study of the Diaphragm," which is well worth pondering. (5) Drinking hot water, or preferably hot salt solution, or injecting the same per rectum and retaining it.

To Increase the Volume of Lymph

The volume of lymph may be increased in various ways, among which may be mentioned (1) Active and passive muscular movements. Landois says: "Muscular activity causes increased lymph production, as well as a more rapid escape of the lymph. The tendons and fasciae

of the skeletal muscles, which possess numerous small stomata, absorb lymph from the muscular tissue," (2) Increase of blood-pressure by any of the manipulative means noted above. In this connection readers are commended to carefully study an address given by Dr. Hazzard at St. Louis in 1904, on "Osteopathic Manipulation of the Blood-Mass." (3) Quantities of hot water or salt solution per os or per rectum. The reason for advising the use of hot water rather than cold lies in the fact that heat dilates the blood vessels, and absorption takes place more rapidly, while cold water causes contraction of the vessels.

It will be remembered that Byron Robinson held that the lymphatic vessels, through their vasomotor innervation, possess the four functions of peristalsis, absorption, secretion and sensation (easily remembered by the word PASS, formed by the initial letters), and he ascribed the cause of most diseases in which the lymph and its flow are concerned (and does not this embrace much of pathology?) to either excessive, deficient or unbalanced activity in these functions.

He strongly urged the importance in constipation and other chronic conditions which the osteopath is frequently called to treat, of giving regularly large quantities of water—better hot—and salt. Seemingly afraid that his patients would scorn or neglect to take plain salt, he gave them NaCl tablets, flavored to disguise the taste, directing that they be placed on the tongue and swallowed with the water. Salt is especially beneficial in that it stimulates the epithelium of the salivary, pancreatic and hepatic glands, the entire digestive tract, the urinary organs, etc. (The one condition in which it is contra-indicated is parenchymatous nephritis, as it is irritating to the inflamed kidney cells.) Both blood plasma and lymph plasma contain more than one-half of one per cent. of salt. All of the glandular secretions contain salt. Salt is an important digestant, especially of vegetables. It is certainly a rational procedure to promote cellular activity by making use of this universal stimulant in the manner indicated above.

Why should we seek to increase the volume and flow of lymph? Because only by having an ample fluid medium can the maximum energy of the cells be attained. It has been proved by Metchnikoff, Bizzozero and others of Virchow's school that the normal individual cell is endowed with and exercises a power of self-defense and self-preservation against invasion. Only with a sufficient volume of lymph is normality of the cells assured—through irrigation of the lymph spaces, maintenance of the nutrition of the cells, and free drainage of the excretions. And only through the continuance of maximum cellular activity can perfect health be maintained.

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CHAPTER EIGHT

BLOOD CHEMISTRY

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"The Law of the Artery is Supreme * * * *."—Dr. A. T. Still.

Upon the principle that the blood is our curative agent, will this blood not give us the best indication of destruction going on within the body? All the tissues of the body are bathed with blood and lymph, and it seems only natural to look to the blood for pathology within these tissues.

If the blood contains an abnormal amount of one or more of its component parts, certainly some part of our anatomy is not functioning properly, and since we know where these various substances are formed, will not the blood analysis be a great aid to us in making our diagnosis? A thorough blood examination seems to me to uphold the basic principles of Osteopathy.

For years Blood Chemistry has been looked upon as belonging exclusively to experimental physiological chemistry, and not in the practical phase as is urine and gastric analysis. Not until Folin came with his Blood Analyses as practical aids in diagnosis, did the professions consider them. Since his introduction of the work, Benedict, Lewis, Denis, M. Myers, and Fine, deserve much credit in introducing reliable methods for clinical laboratory technique.

With the more elaborate technique required for Blood Chemistry the question naturally arises, of what value is it over the ordinary urinalysis to the diagnostician? Here I must hasten to add that it far surpasses the urinalysis; rather, I should say, that they should go hand in hand. The Blood Chemical examination gives us an idea of the retained products of metabolism rather than the pathologically changed ingredients of a fluid, such as the search for albumin and sugar of the urine implies. The blood tells just what the kidneys are doing and what they are not doing, and gives the exact status of the nitrogenous and carbohydrate equilibrium.

The urine tells a great deal about the pathology of the kidney, but we find in conditions such as glycosuria, that a blood analysis is far better. We may have a great retention of sugar in the blood before the kidney permits it to permeate through. In such cases only a blood analysis would detect the hyperglycemia. On the other hand, a pronounced glycosuria may arise with a relatively low grade hyperglycemia. In renal diabetes we have no hyperglycemia, simply glycosuria. With-

out chemical analysis of blood, how shall we differentiate between renal diabetes and diabetes mellitus?

The threshold point, i. e., the time when the sugar increase in the blood results in a pouring out of sugar in the urine, is a matter of debate. Many investigators have arrived at as many different threshold points, and it is for this reason that the blood sugar determinations are so important.

I have found an example of this in a patient showing 220mg of glucose per 100cc of blood, the normal blood sugar being from 85mg to 100cc of blood. Up to that time the patient had shown no sugar in the urine. Very often a diabetic will starve himself for a few days, and become sugar free so far as the urine is concerned, but upon examining the blood, it will be found that the sugar though reduced is far from normal. The kidneys may be impermeable to sugar up to a very high point. In such a case the blood sugar would be quite high, before it would appear in the urine. Folin (Journal Biol. Chem. 1915, Vol. XXII, P. 327) states that he could demonstrate the presence of sugar in the human urine in nearly every case examined. However, this is by delicate technique, but it shows that there is more often sugar in urine than ordinary negative findings record.

It seems that authorities quite disagree as to what is normal and what pathological urine as far as sugar is concerned. On the other hand there is little doubt as to what constitutes the normal blood sugar. Aside from the liver, which Von Noorden aptly calls "a glycogen reservoir," and the muscles which he calls the "glycogen depot" we find another source of sugar in the proteins. The proteins are transformed into amino-acids, such as glycocoll alanine, aspartic, and glutamic acids, and these in turn go over into dextrose. The most recent work bearing upon the derivation of glucose from protein is that of N. W. Janey (Janey, N. W., Arch. Int. Med. Nov. 15, 1916, Vol. XVIII, No. 5, Page 584.) Contrary to existing opinions, it has been found that the animal and vegetable origin of proteins bears no relationship in their ability to produce glucose within the animal organism, this function being dependent almost entirely upon the sugar-yielding amino-acids constituting the various proteins.

We must distinguish between renal diabetes and diabetes mellitus, although we have but little pathology up to the present time upon which to base our diagnosis. Foster and Joslin, who have recently written books on diabetes mellitus, state that the diagnosis must rest upon the chemical blood analysis. Since we have no increase in the blood-sugar, in renal diabetes, and since we do get a decided rise in blood-sugar in diabetes mellitus, we will have to base our diagnosis on these points.

An instance of renal diabetes is the glycosuria of pregnancy. We find no increase in the blood sugar, and following the puerperium the sugar in the urine disappears. Yet should these women become pregnant again they would again show glycosuria. However, in passing we might say that cases of renal diabetes are extremely rare, and in glycosuria a thorough and exhaustive study of the blood should be made before coming to any decision.

The data necessary for the diagnosis of renal diabetes is quite definite:

1. A glycosuria running at a general level and not influenced materially by the carbohydrate intake.

2. A normal percentage of blood sugar in contrast to the increase of sugar urine.

A routine examination of the blood, chemically, will some day be required in clinical examinations. The methods of the day are both accurate and easy to perform to one qualified to do chemical work.

In the so-called alimentary glycosuria (Jour. Am. Med. Assn. Sept. 2, 1916, Pg. 748) we have a condition within the patient in which his capacity for utilizing glucose is lowered. In other words, the sugar shows in the urine by an over-indulgence of carbohydrate food. This condition we do not find in a normally healthy individual, for the healthy liver can store up the excess of sugar as fast as it is produced from the digestion of starches. The rate of entry of sugar into the blood taken per mouth, depends upon a wide range of physical, physiologic, and pathologic conditions, and it will not be possible to force sugar into the blood faster than it can be absorbed. When a certain concentration is reached in the blood no quantity of sugar given per mouth, subcutaneously or intraperitoneally, can raise it higher. Joslin states that one per cent. of all individuals in the United States have diabetes. This is apparently a rapid increase over several years, according to statistics. However, it merely means that through the routine examination of urine today many more cases are discovered.

Using the latest methods of Myers and Bailey (Jour. Bio. Chem. 1916, Vol. XXIV, pg. 147) we find that the amount of sugar is practically the same in blood, plasma, and cells. It was thought by the earlier physiologists that blood sugar was in loose combination with other substances in the blood. This idea of course is now obsolete, for it is known conclusively that the blood sugar is in a state of solution.

In conclusion, let us not forget, in cases of diabetes, that even though the sugar disappears from the urine under treatment we may have a hyperglycemia. The rigid diet should be kept up and blood analysis made

at intervals until the blood-sugar is normal. Also that a routine blood analysis may discover sugar excess in the blood, long before it shows in the urine, thus giving the physician an opportunity to arrest further progress of the diabetes.

Spleen

The spleen and the stomach from the earliest times have been supposed to possess some close inter-relationship. Stukeley, in 1723, assigned to the spleen the function of stimulating gastric digestion. His first argument in favor of this statement was the relative position of the two organs, and the intimate inter-communication by means of their common veins, arteries and nerves. One is forced to ask himself why the principal blood vessels of the stomach arise from the splenic artery in its direct route to the spleen, and why vessels return to the stomach direct from the spleen, as does the vasa brevia. It has been justly called "the heart to the stomach," as it seems always to have a supply of blood ready to furnish the stomach when the call comes, and later, when the supply is not needed, the spleen can recall it.

It has been suggested by Aristotle, Graecus, and Galen that the spleen assists in warming the stomach against the injection of cold foods, liquids, etc. They based their claim upon the fact that animals that drank great quantities of water had large spleens, the size of the organ being regulated by the warmth needed to the stomach. As early as 1868 Baccelli, at Rome, demonstrated a definite gastro-splenic circulation. He found that the veins of the vasa brevia form five or six rectilinear canals, with inter-communicating smaller vessels from the spleen to the cul-de-sac of the stomach, which are devoid of valves so that the blood can pass in either direction. The largest number of gastric glands are situated in the cul-de-sac at the area supplied or drained by these veins.

The splenic artery in the adult is the largest of the three branches of the coeliac axis, and is remarkable for the extreme tortuosity of its course. After crossing in front of the upper part of the left kidney, and on arriving near the spleen, it divides, some of the branches enter the hilum of that organ, some to the pancreas and others to the greater curvature of the stomach. (Gray, 661.)

Thus we see that our osteopathic friend, the spleen, has some function in connection with gastric digestion that still remains hazy in the minds of science. We are told by some that it aids in the pepsin secretion to the stomach; others, that the removal of the spleen has no effect whatever upon gastric secretion. Whatever scientific men may think, I am inclined to believe that the general osteopathic idea is in favor of the phagocytic action arising in this organ.

At least, it is a great field for our osteopathic research laboratories to work on, and I am sure they can and will give us some information in the near future that will be helpful to us individually, and as a profession.

Dr. M. A. Lane told us that within the spleen we have the antibodies to fight off disease. He showed us how to stimulate them to action, but did he tell us why they acted thus? Nevertheless, it is an osteopathic organ, left for osteopaths to discover, and make use of. In Hodgkin's disease we find splenic involvement with hyperplasia of the lymphatic glands, and general anemia.

Hodgkin's Disease

The blood counts in Hodgkin's disease are unsatisfactory. We do get an increase of eosinophiles, but it is believed that the extensive cutaneous lesions may influence these. Levin makes an interesting explanation with regard to the increase of lymphocytes. He believes that the terminal lymphocytosis is due to the crowding full of all the lymphoid tissues and an overflow of lymphocytes into the blood stream. However, he admits that the blood count is usually normal in Hodgkin's disease. He says nothing of the chemical analysis. The lymphoid tissue is involved throughout the body generally, and the advised treatment is Roentgen Ray. In fact, scientific writers have been telling us for some time that the X-Ray offers most in mediastinal complications. It results in a replacement by connective tissue and a diminution in the size of the glands.

My experience with blood chemistry in connection with Hodgkin's disease has been limited through lack of such cases; however, an early diagnosis is the greatest advantage to both the patient and the doctor, and I think through the blood we will arrive at our conclusions, aided by physical examination, and accomplish as much or more than by any other treatment. Osteopathy most certainly will build up the Opsonic index of the blood, and this alone will be a great recommendation for it.

The Laboratory Age will be the Golden Age in osteopathic diagnosis. While we are as yet far from being an exact science, we have eliminated much of the inexactness and have located some of that which remains. Such an age as that through which we are now passing forces many hardships upon those who must keep pace with advancements in all fields of science. With new discoveries we find many opportunities for improving our technique.

With the preponderance of laboratory study and facts, however, some will minimize the non-laboratory side of our diagnosis. We cannot overestimate the significance of laboratory findings, but we must

not underestimate the non-laboratory side. Our patient, too, is a laboratory in which actions are followed by reactions, and if we can stimulate the proper chemical reaction within this human laboratory we have accomplished our purpose. The time is near at hand when the practice of Osteopathy will be based on an understanding which comes from a combination of facts derived from both laboratory investigation, and accurate observation of the patient, interpreted by a doctor who KNOWS HIS PATIENT as he knows the disease, and who refuses to shirk one method in favor of another.

Acidosis

In acidosis of the blood we do not mean an actual acid reaction, for this is impossible in life. It is only in the very last stages of life practically "in extermis" that an acid condition occurs. The neutrality of the blood depends upon the mixture of carbonic acid, carbonates and phosphates. Carbon dioxid is thrown off by the lungs, and the urine in health is acid in reaction thus helping to maintain the alkalinity of the blood. Any excess of acids in the blood seems to stimulate the respiratory centers in such a way that more CO_2 is thrown off. There is also a quick call on the ammonia, from the liver. It is only when the ammonia is being used up that acidosis supervenes. In the course of normal metabolism we know that the ammonia of the body is converted into urea and eliminated as such, but the supervening acidosis takes up some of this ammonia and keeps the blood alkaline. Our analysis in such a case would show a reduction in the urea of the urine as well as a reduction of the ammonia of the blood.

Respiration lowers the concentration of CO_2 within the lungs, thus allowing the CO_2 of greater concentration to pass from the blood through the alveoli to the plane of lower concentration, namely, the lungs, and be removed. It is merely an exchange of different concentrations going on continually, the greater displacing the lesser through osmotic pressure. The sodium bicarbonate occurring in the plasma and the cells, as well as alkaline phosphates of sodium and potassium found in the red cells, are one of our first line defenses against acidosis. Thus we have the alkaline compounds of blood; the kidneys excreting an acid urine from an alkaline blood; the production of ammonia and the proteins combining with the acids of the blood; all lines of defense against the supervening acidosis.

In the prevention of acidosis the consumption of fats must be stopped, since the end product of fat metabolism, in the absence of proper carbohydrate balance, as in diabetes, is oxybutyric acid and diacetic

acid, instead of following the normal path and being transformed into butyric acid. There is no further oxidation. These organic acid derivatives of the fat and protein matter of the body furnish the basis for the so-called acetone bodies. When these bodies appear in the urine we have an acetonuria or a ketonuria. The acetone of the urine is excreted by the kidneys as diacetic acid which later changes to acetone by dropping the (COOH) radicle.

$CH_3—CO—CH_3$ -acetone.
$CH_3—CO—CH_2—COOH$ -diacetic acid.

We find an acid condition of the blood very often in infancy and childhood, in severe diarrhoeas of infancy, and often alone, or rather, uncomplicated. A difficulty of respiration usually brings such a condition to one's mind. Acidosis is such a fatal complication with infant diarrhoea that it is imperative that an early diagnosis be made. Bicarbonate of soda should be administered to infants with severe diarrhoeas, as precautionary means, in quantities to keep the urine alkaline. This is usually done intravenously or subcutaneously, intravenous being the method of choice since rapidity of action is always desired.

The variation in acid base balance of the blood may be stated as follows: the blood bicarbonate may be high, low, or normal, and in each of these conditions the Ph (hydrogen ion concentration) may be high, low, or normal. This would give nine theoretical conditions with, of course, only one being right, that is when the bicarbonate and the Ph are within normal limits. At least six of these possibilities can be produced experimentally and some of them occur clinically. I mention this to bring to your attention the wide range of the acid base balance within the body and the possibility of so many abnormal conditions. Concerning the Ph of the body fluids, other than blood plasma, our knowledge is limited, but all indications are that all these fluids closely approximate the blood plasma in action, or rather reaction. By the body fluids within the body proper we mean such fluids as the lymph, cerebrospinal fluid, transudates, exudates, but not secretions such as gastric juice or urine.

The first effect of a CO_2 retention on the blood is to increase the H_2CO_3 and the (H) of the blood. Davies and Haldane observed, in 1920, that in breathing air containing up to 5% CO_2, there was a doubling of the rate of ammonia and titratable acid excretion. This increase in ammonia and titratable acid tends to raise the bicarbonate content of the whole body, and the blood plasma bicarbonate would normally rise with that of the other fluids. The intercellular fluids, other than blood plasma, have, so far as studied, been found under normal conditions to

approximate the blood plasma in bicarbonate and hydrogen concentration. In the changes from normal the other fluids follow more or less promptly the blood plasma. Van Slyke and Cullen (1917) found that when acid was injected into the circulation the fall of the blood bicarbonate was only about one-sixth as great as it would have been had the acid all remained in the blood; the other five-sixths of the acid must have gone into other body fluids and the tissues, or drawn alkali from them, thus neutralizing itself. This gives us a good idea of the close relationship of the body fluids.

In cardiac dyspnea it seems very likely that the predominant cause of the CO_2 retention, resulting in an acidosis, lies in the lungs. There is interference with the escape of the CO_2 from the pulmonary circulation. Possibilities arising from such a condition are: There may be portions of the lungs in which the circulation is more or less intact, but which contain no air, or there may be portions of the lung which are air containing, but immobile and not adequately ventilated by the respiration. This latter is the view of Siebeck (Siebeck, R. Deutch. Arch. klin. Med., 1912, CVII, 253). However the present methods of measuring the lung volume has failed to answer these ideas, for we are capable of measuring only those portions of the lung which are air containing for respiratory purposes. Whether or not there is a true CO_2 retention in all cases of cardiac dyspnea, there is always interference with the elimination of CO_2 from the blood, and therefore, a compensated or potential acidosis, (John P. Peters, Jr. and David P. Barr, Jour. Bio. Chem. Vol. XIV, No. 3, Pg. 537).

In summarizing briefly, it is quite apparent that greater ventilation is necessary to effect the normal carbon dioxid elimination in cardiac dyspnea. This lack of ventilation is largely brought about by the impairment of the pulmonary mechanism for the exchange of gases between the blood and the outside air. In some cases the diminution of the circulation rate may be an additional factor in the production of carbon dioxid acidosis. We also find in a certain number of cases a reduction of the available alkali of the blood.

From well established facts regarding the process of acid excretion in man, it is absolutely incorrect to assume a depletion of the fixed alkali from an unusually acid urine. The neutrality mechanism in man is remarkably extensible and is capable of neutralizing and conveying into the urine unusually large amounts of acid without disturbance of the acid-base equilibrium within the body. The gross adjustment of an unusual acid production is an increase in production of ammonia. The fine adjustment by means of which the reaction of the blood

is maintained at the normal Ph is managed by excretion of phosphates in correct relative amounts. Slight variations in acid production may be entirely compensated by variation in the relative amounts of the phosphates excreted, the ammonia factor remaining stationary. The acidity of the urine on normal diets may for this reason vary widely, the hydrogen ion concentration being frequently as great as when acidosis is present. It is therefore impossible to obtain from the hydrogen ion concentration of the urine a dependable indication of the presence of acidosis throughout the body.

Acidosis may be recognized in various ways, by an increase in the ammonia co-efficient in the urine, decrease of carbon dioxid tension of alveolar air, the finding of abnormal acid in the blood and urine, increased alkali tolerance, and by diminished titratable alkalinity of the blood serum, by changes in the hemoglobin dissociation curve, and by actual determination of the hydrogen ion concentration of the blood. A change in the hydrogen ion concentration of the blood indicates a failure of the protective mechanism, and the onset of acidosis.

Let me call attention again to the ammonia factor of the body. The body excretes nitrogen in the form of ammonia from the protein. One gram of this ammonia will neutralize five times as much betaoxybutyric acid as one gram of sodium bi-carbonate. Howland (Bulletin Johns Hopkins Hospital, 1916, Vol. XXVII, Pg. 63) tells us that if it were not for these alkalies the body would produce an equivalent to several hundred cubic centimeters of concentrated hydrochloric acid in the course of a day. This condition of the blood is impossible during life, and it throws a great responsibility upon the alkalies of the body for our daily existence.

Whitney's works on acidosis in relationship to the cause of death are important contributions to our literature. Samples of blood were taken from the heart as soon as poossible after life was extinct. The Van Slyke method was used for determination. Out of forty cases examined, dying of various diseases, all except three showed a more or less marked acidosis at the time of death. In many of the cases this acidosis was so severe that it alone was sufficient to cause respiratory paralysis. In other cases the acidosis was not sufficiently high to have been the immediate cause of death. Infection seemed to have a marked influence in causing acidosis. However, a patient may have a marked infection and show no acidosis, providing his powers of elimination are active. As causes of increased acid production in nephritis, the toxemia of the active parenchymatous form is itself operative; infection is an even more powerful factor.

Non-Protein Nitrogen on Blood (NPN)

Non-protein nitrogen is a term applied to the nitrogen remaining after all the proteins have been precipitated out of the blood. The N. P. N. substances in the blood are urea, uric acid, ammonia, creatin, creatinin, sugar, chlorides in the form of sodium chloride and cholesterol. The normal N. P. N. is from 25-30 mg. per 100 cc blood. Many figures have been given by various workers for its determinations, as well as upon the state of digestion at the time the blood is drawn for examination. It has been clearly demonstrated that the N. P. N. of the blood rises and sinks like the tide, with reference to absorption from the digestive tract. This rise is, of course, not a very great one, about 4 mg. per 100 cc of blood, but it is sufficient to necessitate a variable figure for the normal value of N. P. N.

As the kidney is the great regulator of the composition of the blood, maintaining a practically constant level of the N. P. N., it is in disorder of this organ, especially, that most is to be expected from a study of the variations in non-protein nitrogen of the blood. Numerous workers have shown that, in the majority of cases, the N. P. N. increases with an increasingly severe nephritis. In cases tending toward uremia, or showing actual uremia, the values of N. P. N. are markedly increased, reaching in some cases as high as 350 mg. or over for 100 cc of blood. This rarely is seen in conditions other than uremia, so that this factor assumes great importance in diagnosis.

Further, the prognostic value of this examination is shown in that patients with high non-protein nitrogen do not, as a rule, survive for a very long period. Another valuable point in the study of this factor, is that it furnishes a guide to the proper diet to be allowed nephritics, as cases of high retention require restriction of protein. Also, surgical operations should be avoided when possible, in cases of high N. P. N. Ordinarily, in nephritis, the less the phenolsulphonephthalein output, the greater the amount of non-protein nitrogen in the blood. However, in chronic passive congestion of the kidney, from cardiac insufficiency, the output of phenolsulphonephthalein may be markedly diminished without an increase of non-protein nitrogen being found in the blood. Whenever the excretion of phenolsulphonephthalein is decreased, the amount of non-protein nitrogen in the blood should be ascertained, as this will indicate whether the fault lies with a damaged kidney, which is impermeable to the dye, or whether the fault lies with a damaged heart, which is inadequate to convey the blood to its point of exit from the system.

One hour after phenolsulphonephthalein has been injected intermuscularly, fifty per cent. should be recovered in the urine, and eighty-five per cent. at the end of two hours. When only forty per cent. is passed at the end of two hours, (Elliot, Jour. A. M. A. June 5, 1915, Pg. 1885) considers that not only are the kidneys defective, but also there is retention of waste nitrogen in the blood, and blood tests should be made. A single determination of non-protein nitrogen of the blood is not conclusive unless a very large amount is found. But gradual increase from day to day or week to week shows danger of uremia, and uremia is not a poison caused by one poison, but many.

Tillestone & Comfort (Arch. Int. Med. Nov. 1914, Pg. 620) give the following with reference to the amounts of non-protein nitrogen found in the blood:

30 mg. per 100 cc of Blood . . . . Normal
30-35 mg. per 100 cc Blood. . . . Slight increase
35-50 mg. per 100 cc Blood. . . . Considerable increase
50-100 mg. per 100 cc Blood. . . Great increase with serious prognosis.

While uremic patients practically always show nitrogen retention, it is interesting to note that this is not always the case in puerperal eclampsia, unless there has been a long previous nephritis. Fehling says that 5% of pregnant cases, having an old nephritis, develop eclampsia. In other words, puerperal eclampsia may not be a true uremia, as other retained intoxicants may cause convulsions besides those retained by kidney insufficiency.

Gout and rheumatism are diseases on which the differential diagnosis, by blood chemistry, has thrown some light. In gout we find a chronic disorder of metabolism, in which there is an undue accumulation of uric acid in the blood, whereas in rheumatism there is no such accumulation, the figure remaining around 1-3 mgs. per 100 cc of blood. Folin and Denis (Jour. Bio. Chem., 1913, Vol. XIV, p. 82) showed that the amount of uric acid in the blood, under normal conditions, varied from 0.7-3.7 mgs. per 100 cc of blood. However, we always find a hyperuricemia in gout and this condition is long continued while in other joint disorders the hyperuricemia is transitory. In rheumatism we find a temporary increase in uric acid but it will not remain at this level or increase as it does in gout. The obvious procedure, therefore, in suspected gout, is to follow one examination with others at interrupted intervals. The fact that we get a diminution in the uric acid in the urine does not necessarily mean that we have a hyperuricemia. For a positive diagnosis we must look to the blood.

A retention of uric acid in the blood may be earlier evidence of renal impairment of an interstitial type than the classical tests of al-

buminuria and cylindruria. In discussing the blood figure of chronic nephritis, interstitial and parenchymatous in variety, it will be necessary to refer to some of the other facts of the nitrogenous metabolism.

In digestion, protein matter is broken down into amino-acids, some of which are retained and others are transformed into ammonia and eliminated. The greater part of the nitrogen in the body comes from the food, exogenous, and its final elimination takes place in the form of urea by way of the kidneys.

The source of creatinin is almost entirely endogenous. Victor Myers (Jour. of Amer. Med. Science, May 1919, P. 674) gave a very complete article on creatinin determination. The values he obtained are:

1-2 mgs. per 100 cc. blood . . . . . normal
3 mgs. per 100 cc. blood . . . . . rather serious
4 mgs. per 100 cc. blood . . . . . very serious
5 mgs. per 100 cc. blood . . . . . fatal

Theoretically, the increase in creatinin of the blood should be a better index of the decrease in the permeability of the kidney than the increase in urea, for the reason that the source of creatinin is entirely endogenous and very constant. Urea, on the other hand, is largely exogenous, under normal conditions, and its formation subject to greater fluctuations. For this reason it is evident that a lowered nitrogen intake may reduce the work of the kidney in eliminating urea but it will not affect the creatinin to any great extent. It is only logical, therefore, for us to look to creatinin to furnish a satisfactory criterion as to the deficiency of the excretory power of the kidney and as a most reliable means of following the terminal course of the disease. The prognostic value of 5 mgs. of creatinin, or more, in the blood is very definite. It warns of the fatal termination of the disease invariably.

By the examination of the urine alone, a great many conditions go unnoticed and a favorable prognosis is given when the patient's chances for recovery may be very small.

The normal amounts of the Non-Protein-Nitrogen constituents of the blood are:

N. P. N. . . . . 25-30 mgs. per 100 cc. blood
Urea Nitrogen . . . . . 12-15 mgs. per 100 cc. blood
Uric Acid . . . . . 0.7-3.7 mgs. per 100 cc. blood
Creatinin . . . . . 1-2.5 mgs. per 100 cc. blood
Creatin . . . . . 5-10 mgs. per 100 cc. blood
Sugar 0.08-0.12%
Chloride as Sodium Chloride 0.65%
Cholesterol 0.15%

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CHAPTER NINE

THE EFFECTS OF EXERCISE ON THE LYMPHATICS

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The two great functions, respiration and circulation, are made more active through the physiological effect of exercise. It is impossible for any of the organic functions of the body to be separated from the result of the work of the muscles. The increased frequency of the pulse rate, and hence the quickened blood current during exertion, is the result of muscular contraction. It is observable that every organ during activity has a greater amount of lymph bathing its tissues, than during a quiescent state.

As we study and analyze the results of exercise, we are forced to realize that the daily regular and frequent repetition of muscular movements cause an increased activity in the venous, arterial and lymphatic system, thus relieving the tissues of congestion, and bathing them in nutrition, and by these changes improve and protect the system from various disorders.

The same fact is observable in the lungs—by exercise the improved circulation results in greater power, i. e., greater regularity and control in in performing movements, greater development and strength.

The heart also gains by well-directed regular exercise. It becomes less excitable upon exertion. The beginner in exercise shows various disturbances upon the slightest movements, but not so the one who has had training regularly. The improved heart action furnishes a better flow of lymph to its ultimate destination.

The man who accustoms his body to regular work improves his organs, just as a laborer can do better work with better tools. The man who systematically trains his body gets better work out of it and better service for humanity.

Man is restricted by mental intensity and muscular restraint. This restraint interferes with and defeats Nature. She not only cannot express herself through such a tense, high-keyed instrument, but such restraint causes great waste of nerve energy and also interferes with flow of lymph. To get rid of this nerve tension use relaxing, resting movements.

Daily invigorating and relaxing exercises are necessary to promote the onward flow of lymph towards its final discharge into the blood. Apparatus is unnecessary; no special clothing is required; exercise taken

nude before mirror is best. Ten minutes in morning and fifteen or twenty at night, after the form of exercise is learned and old habits broken.

We should consider exercise a part of our daily routine, same as we do washing the teeth, combing the hair, bathing, etc.

The thread-worn remark, "I haven't time" no longer holds. Efficiency is the commander. It takes no more time to stand correctly than it does to "slump-on-one-hip." It is not a question of time as of learning relative values. Cause and effect in the body is the law. It is impossible to be structurally abnormal and physiologically normal.

Would an aeroplane pilot try to run a plane by any laws other than those necessary to the perfection of the invention? He knows the infinite amount of trouble he would incur if he did not first become informed as to the laws of the machine he is to run. Yet how about the human machine? Frequently all law is disregarded. The FIRST LAW of all machines—balance, equilibrium, harmony, adjustment—is often forgotten. The human machine, if out of balance, will not run perfectly any more than any other machine.

From our osteopathic point of view, one of the most important causes of disease is the maladjustment of the bones of the skeleton. Hence, if the framework is wrong, all else is wrong, the circulation in the veins, arteries and lymphatics being among the first to suffer.

The body poise is mechanically correct if the ankles, hips and spine are correct. When the spine is in correct position, all other parts, the trunk, chest, neck, head and shoulders, are in correct positions. There is such close co-ordination between all parts of the body that if even one is out of place then one or all other parts will suffer.

The phase of readjustment which I will discuss will be muscular. The keynote of our profession is normality of bony structure. In our eagerness to perfect alignment we sometimes forget to recognize the importance of muscular tonicity; we sometimes forget that the "vis-a-tergo", of the power from behind, is necessary to the onward flow of lymph. We sometimes forget that the maintenance of normal bony structure is due to the strength of the ligaments and muscles.

The different parts of the body can only be kept in condition by performing the different functions normal to them. The muscles in performing their functions not only improve their own quality and tone and keep the normal bony alignment, but they improve the health and strength of the entire system, including brain, nerves, heart, lungs, pelvic organs, etc., through the effect produced upon the respiration, the venous, arterial and lymphatic circulation and digestion.

All of our muscular work should be based upon scientific principles and in perfect harmony with natural laws.

People frequently say, "I believe in exercise but I am too old; my muscles are too stiff," never realizing they are lessening their chances of life by this very inactivity. As all the tissues receive their food through the lymph, then sluggish lymph means lessened circulation, hence shorter life. Physical education should not be limited to the period of youth. Indeed, those who begin to feel the weight of years or rather the crippling effect of bad physical habits, need the help that can be derived from rational exercises even more than do the young.

By regaining lost flexibility and youth, and learning to economically use his nerve force, it is possible for many a person past his prime to make his more advanced age his best years physically. One cannot be too old to exercise. So long as we abide in our bodies, we should strengthen them by daily exercise as much as by daily food. Muscles that are called stiff are usually either tense or weak. Muscles that are not duly exercised lose their shape, their firmness and their strength, due largely to the lymph in the lymph spaces not being sufficiently stimulated through pressure by muscular contraction. Nowhere else does this muscular degeneracy so rapidly steal away our health and our efficiency as in the waist muscles. The abundance of lymphatics in this region arrest the necessity for muscular activity. A person is years older or younger in appearance, health and efficiency according to the tone and health of these muscles. We might truly say, we are healthy in proportion to the normality of our lymph flow. To avail oneself of the opportunity of exercise is each person's own responsibility.

We must change our habits of life, we must change our style of dressing. Great strides forward have been made in woman's dress lately, and soon we will wear clothing of such a character as to leave the body unhampered and unrestricted.

If the corset were a necessity for the maintenance of health for women, according to the Divine Plan, the Lord in his omnipotent wisdom would have given us one with which to start life's journey. There is no more excuse for women to wear corsets than men, primarily, but the style of dress and lack of physical education have been responsible for the weak abdominal muscles that sometimes demand artificial support.

In the measuring of man, where do we stand physically? Where do we stand in physical efficiency? Just what is our balance on the ledger of life? We are beginning to appreciate the vital importance of knowing the physical examiner's report. Why consider brains and training of other kinds and neglect the body?

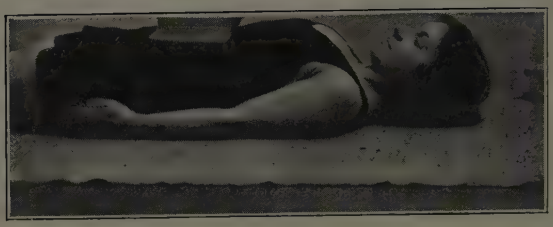

PLATE XXXV.

PLATE XXXVI.

PLATE XXXVII.

We KNOW mathematics but we do NOT know that in order to have health, we must have a normal lymphatic system; that the lymph vessel has its origin within the tissues, and carrying, as it does, the nutriment to nearly every cell and tissue in the body, it must be kept normally active; that the normal flow of lymph is essential and that the "lymph movement" is largely due to muscular activity.

It matters not what the occupation, the habits, the conditions, the environment of the individual, it is the BALANCE between the receipt and expenditure of VITAL FORCE which constitutes perfect health.

We can only maintain our normal physical standard of excellence and efficiency by deliberate and adequate care.

The body must be developed with the same care and thoroughness as the mind, if it is to stand the stress and strain of life and measure up to one hundred per cent. efficiency.

The highest aim of education is to liberate the mind and spirit—to set them free. This means that the body, the medium through which we reveal the intelligence and fine spirit within, must be MADE and KEPT plastic and obedient.

We must learn to despise the pitiful restrictions which we have allowed fashion to put upon us. We must do away with all restrictions of the foot, waist and throat before natural symmetry of the body can be regained and preserved. We must learn to admire the body with all its natural spontaneous power and pliability, its capacity for action, its instinctive unhampered ease.

Activity is life. Inactivity is disease and death. There is nothing in this wonderful world of ours quite so wonderful, nothing quite so beautiful as a perfect man or woman physically. And whether you consider it from an æsthetic standpoint, or that of the greatest utility, there is no consideration of human life quite so significant, so important or so desirable.

It does not seem, therefore, that any well chosen care we can bestow on physical education can be unimportant or undignified, or that any element of culture is more needful than the perfecting of our bodily fitness and growing vigor.

We American women do not ask our men to be reputable citizens ONLY, but to be admirable and creditable examples of physical manhood as well.

By a systematic stimulation causing a thorough and complete drainage of the lymphatics, a vital resistance in the body is built up and maintained, which will protect it and prevent infections of various kinds.

PLATE XXXVIII.

PLATE XXXIX.

PLATE XL.

In health we should take all around activity which will insure normal lymphatic drainage. This spells Protection and Prevention, for health depends upon an even control of all parts.

With the installing of modern heating plants in homes, the indoor clothing has been modified. Bodily habits and activities must adjust themselves to the changed conditions which the last decades have brought, if health is to be maintained.

The necessity for increased activity is due to the various efficiency devices, which have replaced muscle activity. The world demands brain—not brawn—to handle its problems. Health demands brawn as well as brain. As the various occupations do not furnish sufficient opportunity for the best development of the body, exercises, intelligently prescribed and conscientiously taken, just supply this deficiency. It is as important to study HOW to maintain the greatest bodily resistance, how to keep the body immune to the various ills which attack it, as to study disease itself.

There are practically few diseases which cannot be benefited by exercise, either passive or resistive. The laity and many physicians as well, are in the habit of thinking of exercise only in its strenuous forms, just as they are thinking of Osteopathy as a vigorous form of treatment and suitable only for the robust.

It is a question of the intelligence of the physician who prescribes exercise on one hand, and the skill of the physician in giving the adjustive technique on the other. It is knowledge, ability, and judgment, not force, that is needed.

The kind of exercises, both in quality and quantity, needed for the growing individual, as well as the adult, in various stages of physical development, is a problem that faces the physician daily. The understanding of the theory of the different systems of gymnastics; the ability to get co-operation from the gymnastic instructor, who carries out the physician's directions, just as the nurse does in carrying out the physician's instructions; the ability of the physician to demonstrate in his own body the same normality of structure as he professes to produce in the patient, are all problems to meet.

The average gymnastic instructor who is able to display well-developed muscles, do stunts on apparatus which appall the untrained; the nurse whose experience has given her a great amount of skill, frequently handicap the physician. Both, often disastrously presuppose their ability embraces the knowledge of pathology and symptomatology of disease which characterize the broader work of the physician. If the physician would train his own body to normality of posture, of mus-

PLATE XLI.

PLATE XLII.

PLATE XLIII.

cular control; if he would acquire some of the skill of a nurse in handling a patient, he would get better co-operation and the patient would profit. There is a certain contention among the gymnasts, nurses and physicians. Each must know his relative place, recognizing that all are necessary to the goal of Health. Emerson says: "How can I hear what you SAY, when what you ARE is forever thundering in my ears?"

When we consider that the bones of the body would fall apart if it were not for the ligaments and muscles, that the accuracy with which the bony, articular, adjacent surfaces fit depends upon the strength of these ligaments and muscles, there is left only the necessity for maintaining the normal strength of these tissues. It is not a question of "shall we exercise, but we MUST exercise."

Due to the progress of civilization, so many of the opportunities for muscular exercise have been taken away that it will now become a part of our course of study how to conscientiously exercise enough to keep the organism to its standard of vital resistance. So many of the occupational diseases are due to this very lack of proper attention being paid to this phase of life; i. e., to the need of all around exercise.

The longer hours in school for children, thus lessening the activity normal to them; the ever-increasing modern devices which are labor-saving, thus cutting down the opportunity for muscular activity so necessary to the normal body; the increased demands for mental concentration to accomplish more in shorter time, which means further expenditure of nerve force; the lessened amount of sunshine and the quantity of fresh air, are all changes due to city development. Beginning with the tot kept in school for at least five hours of the day, to the factory worker, the bookkeeper, the stenographer, and to the various forms of ever increasing sedentary life—forgetting that exercise is ever fundamental to growth and health—is a situation which handicaps the efforts of physicians of all schools today.

Exercises should be in line with the natural functions of the body. There are methods in climbing, methods in jumping, methods in running and walking, so it ever is in exercise—the method used is all important.

The following exercises are planned so as to promote and restore normal lymphatic circulation, thus increasing nutrition and improving the general health:

An exercise for strengthening abdominal muscles and accelerating lymph flow through the abdomen, is done with a weight. Lie on the back, put as heavy weight (a book will do) as can be lifted easily upon abdomen and raise abdomen up and down. (Plate 35). Increase weight in proportion to increase of strength of muscles. The back remains on the table constantly.

PLATE XLIV.

A simple but excellent exercise for strengthening abdominal muscles (Plate 36.) is to lie on back, place book or other weight across legs at ankles, raise feet, holding legs stiff. This strengthens leg muscles also.

For increasing rib action use same weight on chest (Plate 37) raise and lower in the same manner.

For loosening muscles of the spine the following is most excellent: (Plate 38) Place the clasped hands at the occiput and with strong pressure force the chin to the neck. Begin rolling the head and trunk forward and downward as though you could roll the body into a ball. Continue the rolling movement as far as possible until you have gained a decided stretch on the sciatic nerve or make the head touch the legs, (Plate 39). Returning to normal position slowly, breathing constantly.

This exercise (Plate 40) is for the abdomen, back and ribs, and is very far-reaching in its effects: Sit upon a stool, and bend the body backward until the head is near the floor. Then rise slowly to a sitting position. The feet may be kept on the floor by putting toes under a chair or a strap attached to the floor for the purpose.

Clasp hands at back of neck, (Plate 41) stride forward on left foot, bend body forward until chest is on thigh. A comprehensive and effective movement that can be varied in several ways to take in all parts of the body. A good variation is to extend hands above head instead of clasping in back of neck, and take same movement as described.

Breathing may be considered the most important of all the functions of the body. All other functions depend upon it. Man may exist some time without eating, a shorter time without drinking, but without breathing his existence may be measured by minutes. The majority of women do the upper chest breathing only. The majority of men do the lower mid-chest breathing. I will take up with you the different areas, the upper, mid-chest and diaphragmatic, and how to gain control of them and the freeing of the ribs, which is essential to normal breathing:

The patient will lie on the table, on the back, knees flexed. Take an ordinary breath and exhale. After taking a breath lift the chest wall, thus drawing in the abdomen. Do this to the count of 1; to the count of 2 lift the abdomen. This will draw in the chest. Alternate rapidly to the count of 1-2, 1-2, 1-2. In this way you will get an internal abdominal massage better than anyone can give you. Every organ, every particle of tissue within is lifted and vibrated by this movement. Extreme tenderness may be felt at first. Do it slowly but more rapidly as you become more skillful and gain in control. To make it more diffi-

PLATE XLV.

PLATE XLVI.

cult, take a deep breath abdominally—I say abdominally in order to make it clearer. Muscularly distend the abdomen as far as possible. Then take the exercises as above described with the count of 1-2. Placing the hands in front of the lower ribs in the diaphragmatic area, say the word "Yawn," drawing in the breath and feeling the distention in the diaphragmatic area only. This will be quite difficult to get and will never be done perfectly unless you stand on the balls of the feet with the chest well lifted and abdomen drawn in. Place hands on sides in diaphragmatic area and repeat "Yawn," getting lateral movement in the ribs.

Place the hands in the mid chest, laterally, taking in the breath and forcing the ribs out. Hold the diaphragmatic and mid breath taken and feel the upper part. Try these different areas by placing your hands upon them separately until you have gained control and until you can breathe in any part separately; then combine.

Roll over on to shoulders and head, support the hips with hands, elbows resting upon the floor, (Plate 42). Alternate leg movement, similar to riding a bicycle. This exercise can be varied by flexing both knees down to chest; straighten and flex several times. Also try to touch floor over head. Alternate feet and do it with both feet together.

Plate 43. Bend the body at right angles to legs. Bend the right knee (if unable to keep straight) and touch the floor in front of right toes, at same time extend left arm upward and backward. Alternate same movement with left.

Plate 44. Bend body sidewise keeping it in same line as when erect and with right hand touch outside of leg as near knee as possible. Flex left arm at elbow having closed hand high in axilla. Alternate movement with opposite side.

Assume squatting position as shown in Plate 45 with clasped hands well back between legs; rise to erect position with hands extended overhead; bend backward from the waist, lifting and rounding out chest as shown in Plate 46.

Great attention should be paid to the vasomotor hygiene. Much of life depends upon the proper functioning of this system. Muscular activity, the control of the emotions, are both dependent upon it for their well being.

The insane asylums furnish us with many examples of perverted emotions due to the lack of a proper circulation to the various organs. Over-wrought emotions, wild delusions, vivid hallucinations, are not often found among those whose muscles are firm and vigorous.

The health of the vasomotor system depends largely upon proper muscular exercise. The cold hands and feet of the student are often due to this lack of exercise. Other irregularities occur when the system is not kept in proper tone.

The circulation of the lymph is of the greatest importance and is chiefly carried on by muscular contraction. The lymph spaces are squeezed by the pressure and the fluid is forced onward. Exercise hastens this circulation.

All respiratory movements assist in drawing the lymph onward, as they assist the blood current to move more evenly and normally toward the heart. It is quite probable that the muscular fibres in the walls of the lymphatics themselves have a rhythmical contraction. The contractions of the muscular fibres of the villi appear to further the chyle movement from the lacteals into the valvular lymphatics. As the lymph vessels gradually unite into the larger ones, an increased pressure must result, thus further assisting in its onward flow.

There are nearly seven hundred lymph nodes in the body. The greater number lie in the chest and belly cavities, with a few in the neck, face and limbs, but some in nearly every part of the body.

All tissues of the body derive their nutrient material from and excrete their waste products into the lymph. The oxygen and food absorbed into the blood pass through the capillary walls into the lymph, bathing all tissues.

Knowing this, effective exercises can be planned which will function for each part.

CHAPTER TEN

PART ONE—LYMPHATIC GLANDS OF THE NECK

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Lymphatic glandular enlargements of the neck may be divided into groups for descriptive purposes. First group Non-tubercular cervical adenitis

Etiology { from focal infection of nasopharynx, mouth and face, jaws, teeth, middle ear, mastoid, salivary glands, etc.)

Clinically.

This type may or may not have an elevation of temperature and polymorphonuclear leucocytosis, depending largely upon virulence of organism and extent of involvement. However, if there is a constant increase of temperature and an increase of the polynuclears, it is significant of this variety of cervical adenitis.

Particularly is this prone to occur if there is a rapid increase in size of this type, for they then undergo necrosis and suppuration.

This train of circumstances is not characteristic of the tubercular type and is useful as a differential diagnostic point.

If these glands do not progress to suppuration they rarely attain a very large size and though occasionally isolated nodes are observed (the size of a bean) over a long period of time, the tendency is for them to be transitory. In other words, those which do not develop to a larger size (say the size of a walnut) rarely suppurate and soon return to their normal size.

Second Group.

Tubercular cervical adenitis or "scrofulous neck swellings" are the next most common. The proportion of these two groups are approximately five of the first group (considering those which go on to suppuration) to one of the second group.

The Etiology.

The mode of infection is very similar to that of group 1, but the tubercle bacilli being the organism present. The structures of the mouth, nasopharynx and larynx being the primary foci from which the lymph nodes are involved secondarily. Chief among these are tuberculosis of tonsils and adenoids and a great many cases, no doubt, are directly infected through mucous membrane upon which is left no clinical trace of tuberculosis. Wright's description of this latter process seems to be quite logical. It has been demonstrated experimentally and observed clinically. The mucous membrane absorbs, the lymphoid tissue harbors, and the lymph channels carry the tubercle bacilli.

Clinically.

The tubercular nodes as a rule have a tendency to attain a larger size than those in group 1, and do not undergo suppuration as quickly. To illustrate, take two nodes of the same size (the size of a walnut) one in each class. The one in class 1 will develop to its size and suppurate in days, while the one in group 2 will take weeks before it will attain the size of a walnut and abscess formation occur.

The temperature, if elevated at all, is more apt to be the characteristic evening rise and morning fall, the increase in white blood cells, due to lymphocytosis rather than multiplication of polynuclear leucocytes.

Von Pirquet's test for tuberculosis in young children may also be of help in differential diagnosis, particularly if it is negative. The above points or rules are of course, not infallible; they vary with the individual case, stage of involvement and complications, but as a whole they are characteristic of the majority of uncomplicated cases of tubercular cervical adenitis.

It is not the purpose to discuss here the probable outcome of tubercular cervical adenitis with and without various modes of treatment, but because of the prevalency and importance of this malady, it is deserving of a little further mention.

There is a possibility of the local tubercular process in the neck becoming disseminated, most frequent of which, of course, is the pulmonary involvement. The very probable local disfigurement as a result of cold abscess formation, fistula, etc., which is much more prone to occur under any other line of treatment than complete excision. The complete excision should be done as soon as the diagnosis is made, and an early diagnosis is important.

Third Group.

Lymphatic enlargements as a result of old syphilitic infection. The posterior cervical nodes are most commonly involved of the neck lymphatics. They rarely attain a very large size unless mixed infection is present, and syphilis of cervical nodes is usually associated with the same type of enlargements of lymphatics in axilla, inguinal region and above the elbow. They rarely suppurate and are present for a long period of time. The blood Wasserman examination, of course, is of value here in making a diagnosis.

Fourth Group.

Hodgkin's disease or Pseudoleukemia. This fortunately is not very frequent and unfortunately most always fatal. It does not respond to the Von Pirquet's test, and rarely suppurates. Clinically, it can be divided into two stages. In the first stage there are no signs except a

mass of nodes which are in most cases in the neck and the general health seems to be surprisingly good. In the second stage, groups of nodes may be involved almost any where, axilla, mediastinum, inguinal region, etc., steadily increasing in size, this accompanied with an anemia which becomes progressively worse.

Various forms of treatment have been advocated, chief among which are X-ray, radium and surgery. In the first stage, surgery seems to offer the best means of delaying the steady progress of the disease. After generalization or second stage, the most that is warranted by way of operation is removal of a node for diagnosis and further surgery to do what is possible for mechanical interference with respiration or deglutition, such as a tracheotomy or excision of cervical nodes if the difficulty is due to the neck glands and not those in the mediastinum.

Fifth Group.

Cystic lymphangioma is very rare and often attains a very large size, may be stationary in size for some time, and then suddenly begins to increase; most common in youth and early adult life.

Lymphosarcoma is another rare condition and is more frequently diagnosed by microscopic section than clinically.

NOTE: Other cysts and tumors of the neck such as bronchial, parotid and thyroglossal cysts, hygroma colli, tumors of the carotid body, enlargements of the thyroid and aneurism must be considered at times in a differential diagnosis.

All the above cases, both surgical and non-surgical, should have osteopathic care, particuularly directed to bony lesions and improving constitutional condition.

That variety of cervical adenitis which is non-specific and non-suppurating, in addition, should be cared for along the lines advised by Dr. Deason.

Briefly summing up the therapeutic indications for all the above cases, is to treat conservatively with recognized osteopathic care, instituting surgery when indicated and then post-operative osteopathic work to accomplish the maximum normalization possible.

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CHAPTER TEN

PART TWO—THE LYMPHATICS OF THE CHEST

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The workings of the lymphatics of the chest are hidden from us, except as they are manifested to us through disease.

The lymphatics of the lung take their origin from the pulmonary lobes, while others take their origin in the fine connective tissue network. The lymphatics of the visceral pleura join with those draining from the lobes of the lung surface, and form the superficial collecting trunks terminating in glands at the root of the lung. The deep trunk is made up of the lymphatics from the deeper lobes and those of the bronchi; the latter, having free communication with the surface of the organ, terminate in the peribronchial lymphatics, which, accompanied by the bronchi and vessels, terminate in the hilum.

The lymphatics of the pleura offer an interesting study in drainage, the pleura being a closed serous cavity, the inner surface being lined with endothelium, the costal and parietal portions being in close contact. It is lubricated by serous secretions and is well supplied with blood vessels and lymph.

The lymphatics are formed in two series, one beneath the endothelium, the other in the cellular portion adjoining the pleura, both having free communication. As previously indicated, the visceral portion joins the lymph draining from the lobe surface and forms the superficial collecting trunk which terminates in the hilum of the lung. The costal portion of the parietal layer is well drained by the deep intercostal lymphatics, and these terminate in the mammary glands and vessels.

The communication of the deep with the superficial intercostal lymphatics and the free communication of the latter with the lymphatics of the chest explains the involvement of the axillary lymphatics in thoracic disease.

The lymphatics of the pleural and parietal surfaces of the diaphragm communicate freely. Infection passing from one serous sac to the other can be explained in this manner.

Poirier, in his works on lymphatics, explains the frequency of pleurisy as a sequel to abscess and infection of the liver as due to the fact the lymphatic vessels from the liver pass directly to, and drain into, the subpleural lymphatics of the diaphragm.

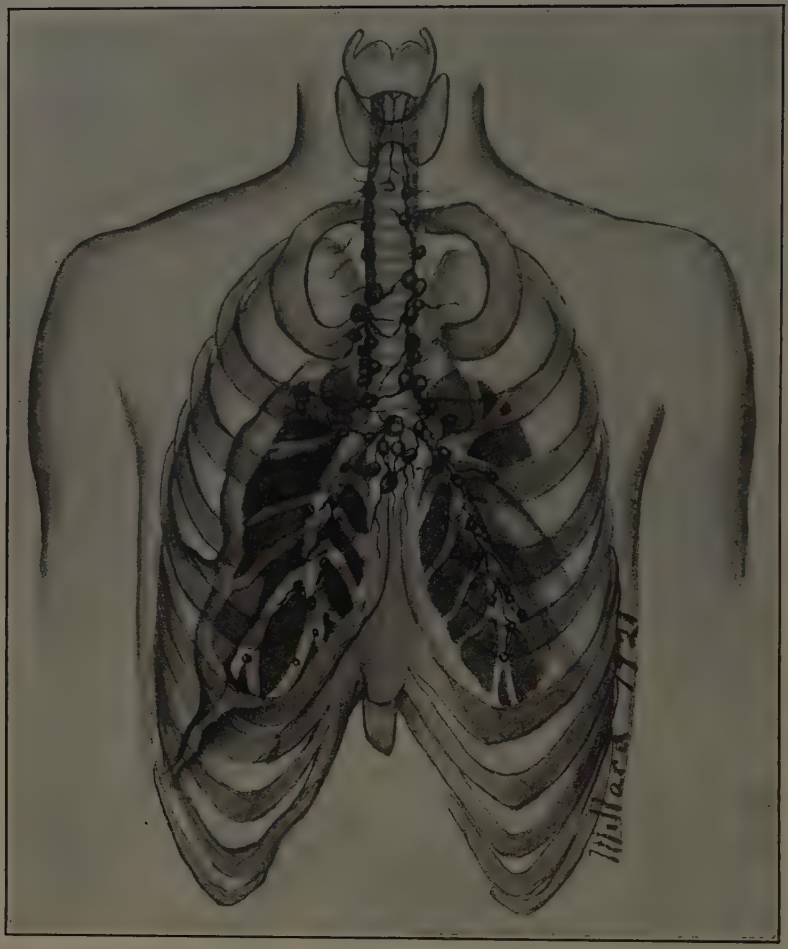

PLATE XLVII. Lymph Nodes in relation to Larynx, Trachea and Bronchi. The uppermost node is the pre-tracheal. This new X-ray effect to illustrate the transparency of the various tissues will be carried out from time to time. Note the nodes on the bronchioles and the possibility of infection traversing the entire laryngeal, tracheal and bronchial regions.

Treatment for drainage and circulation of the Thorax.

In cases of pneumonia and allied conditions, there is one master treatment which accomplishes amazing results. This, I term the "make and break" movement. With one hand on the heads of the ribs posteriorly and the other on the ribs anteriorly, spring the ribs rhythmically in a line with their angle, alternating the pressure from hand to hand.

To promote vaso-dilatation, sit down beside the patient with the hands at the 2nd and 3rd dorsal vertebrae. Exert pressure enough to almost raise the patient from the bed yet not quite do so. Alternately relax and inhibit for 10 to 15 minutes, repeating as the case necessitates. Then, standing at the head of the bed, grasp the neck as low down as possible so as to get straight traction on the 2nd dorsal. Make and break for dilatation of the lung arterioles. Direct pressure movements downward and backward over the sternum and upper seven ribs on each side, the patient lying on his back, are very efficacious in stimulating the lymphatics.

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CHAPTER ELEVEN

PART ONE—LYMPHATICS OF THE EYE, EAR, NOSE AND THROAT

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A healthy lymphatic flow is essential to the life and function of every important tissue. The large lymphatic vessels empty into veins. The vessels start with capillaries. The lymphatic system is composed of superficial and deep lymphatic vessels with many lymphatic nodes scattered throughout the body. The lymphatic vessels are thinner-walled than the veins. They do not have anastomoses except through lymphatic nodes.

All lymphatic vessels have valves. The lymphatic nodes interposed in the lymphatic system have the function of counteracting and destroying poison. Most of the lymph traverses some nodes before entering the veins. The largest lymphatic nodes are only about three centimeters in diameter.

Quite large lymphatic stems are found on each side of the head and neck and in the abdominal viscera, into which the lymph is gathered and emptied into the veins of the lower neck or upper thorax. There are seven large lymphatic stems, three of which unite to form the thoracic duct which also receives two other stems. The thoracic duct begins at the level of the second lumbar vertebra and ascending upward empties into the left subclavian vein. It receives the lymphatic stem that drains the left side of the head and neck. The right lymphatic duct empties into the right subclavian vein.

The right jugular lymphatic trunk drains the right side of the neck and head. It originates from the deep cervical nodes. The right subclavian trunk originates from the right axillary nodes and carries the lymph from the right arm. The right bronchomediastinal trunk originates from the bronchial and mediastinal nodes. It drains the right thoracic wall, right lung, the heart, esophagus and part of the liver.

Lymphatic Nodes of the Head and Neck

1. Under the skin upon the insertion of the sternocleidomastoid muscle, which is back of the ear, are located two or three small lymphatic nodes. The lymphatic capillaries gather into these nodes from the posterior auricular region.

2. Just back of the posterior auricular nodes upon the insertion of the trapezius muscle are usually one or two small nodes which drain the occipital region and send efferent lymphatic vessels through the superficial cervical nodes.

3. The parotid gland lies in front and below the external auditory canal superficially. Upon this gland just under the skin and in front of the ear are three or four small anterior auricular nodes. Capillaries from the temporal region terminate in these nodes by giving efferent vessels to the superficial cervical or submaxillary nodes.

4. Within the large parotid gland are found a few lymphatic nodes. The lymphatic capillaries from the eyelids, from the external ear and from the gland itself gather into these parotid nodes. Efferent vessels from the parotid nodes pass to the superficial cervical and superior deep cervical nodes.

5. Deep facial nodes are found upon the buccinator muscle and in the lateral wall of the pharynx. These nodes receive the deep lymphatic vessels of the face coming from the orbit, nose, palate, cheeks and pharynx. They join with the deep cervical nodes.

6. Just beneath the mandible and between that and the digastric muscle are eight or ten quite large lymphatic nodes. These are known as the submaxillary lymphatic nodes. Just anterior to these resting on the under surface of the mylohyoid muscle are the submental nodes. These nodes drain the anterior part of the face and the chin.

7. The submental, submaxillary and deep cervical nodes receive most of the lymph drainage from the tongue. Sometimes there are found on the hypoglossal muscle one or more small lymphatic nodes that receive part of the drainage from the tongue and send efferent vessels to the submaxillary and submental nodes.

8. The superficial cervical nodes are found just under the platysma myoides muscle and lie upon the sternocleidomastoid mostly along its posterior body and at the inferior border of the parotid gland in the anterior region of the neck. They receive the capillary drainage from the region of the neck in which they are situated. They also receive efferent vessels from the anterior and posterior auricular nodes, the occipital and the parotid nodes. They terminate with vessels in the deep cervical nodes.

9. Ten or fifteen nodes are found in the upper cervical region along the internal jugular vein. These are known as the superior deep cervical nodes. They collect the lymphatic capillary drainage from the cranium and receive vessels of the facial, parotid and submaxillary nodes. They also receive drainage from the pharynx, tympanum, Eustachian tube, inner ear, part of the thyroid gland and larynx.

10. In the supraclavicular fossa and around the lower part of the internal part of the jugular vein are the inferior deep cervical nodes. They receive efferent branches from the superior cervical nodes, also branches in the lower trachea and esophagus. Most of the drainage from

the head and neck passes through the inferior deep cervical nodes. The superior and inferior deep cervical lymphatic vessels join with the superficial lymphatic vessels and with their nodes from the jugular lymphatic plexus and terminate below in the jugular lymphatic trunk.

A little study of the diseases of the eye, ear, nose and throat in conjunction with lymphatic circulation and its nodes, will aid materially in the understanding of right diagnosis and treatment.

In children having furunculosis of the external auditory canal or some infection in that region, enlarged nodes may be noticed just over the insertion of the sternocleidomastoid muscle. Infection in the nasopharynx or pharynx and the sphenoidal sinus may cause enlargement of the occipital nodes, the superior deep cervical nodes just back of the sternocleidomastoid muscle. Also, the inferior deep cervical nodes may be enlarged from disease, infection and poisoning from any region in the head.

Infection in the parotid gland or its immediate vicinity, the eye lids or the external ear will enlarge the parotid nodes, apparently enlarging the parotid gland. Infection in the orbit, in the sinuses in the region of the soft palate and pharynx may show an apparent thickening in the region of the buccinator muscle on account of the enlargement of the deep facial nodes.

The most common place to find enlarged lymphatic nodes is in the submaxillary region. The reason for this is that efferent vessels from practically all the nodes above enter the submaxillary nodes. Any infections in the anterior nose or the teeth may cause an enlargement of the submaxillary nodes. It is quite common to find the superficial cervical nodes enlarged which lie upon the sternocleidomastoid and along its posterior border and at the inferior border of the parotid gland. These nodes receive efferent vessels from the nodes above.

Infection in the pharynx, tonsils, nasopharynx, middle ear, Eustachian tube or the internal ear may carry infection into the superior deep cervical nodes in the carotid fossa along the internal jugular vein. In tonsillar infection, one or two of the large superior deep cervical nodes are almost constantly enlarged. It is one of the diagnostic signs of infection or absorption of toxic material from the tonsillar area.

Our treatment should be directed to the opening up not only of blood circulation but of freeing the lymph circulation in the treatment of diseases of the eye, ear, nose and throat. The lymph drainage, of course, is always in this region from above downward. Any sources of focal infection should, of course, be cleared up in order to relieve the lymph from the burden of counteracting, eliminating and constantly absorbing toxins.

GLENN S. MOORE, D. O.
CHICAGO, ILL.

CHAPTER ELEVEN

PART TWO—LYMPHATICS OF THE EYE AND EAR

GLENN S. MOORE, D. O., Chicago

Lymph drainage is an important feature in the balance of the body mechanism, and the factors whereby this physiological equilibrium is maintained are of utmost importance to the patient and to the profession.

In the following brief summary we shall endeavor to give a concise and accurate statement of fact concerning the lymphatic system, with suggestions as to the most effective points of approach for the opening of the drainage from the eye and from the ear.

The Eye

The lymphatics of the eye are numerous and extensive. They consist largely of lymph spaces which communicate directly or indirectly with one another. In addition to the lymph system of the lid, there are virtually two lymph systems which are termed the anterior and posterior group systems. In the anterior group are the lymph spaces of the cornea, of the iris and of the aqueous humor. The aqueous humor passes from the posterior chamber to the anterior chamber, escaping by way of the spaces of Fontana and the canal of Schlemm, eventually draining through the spheno-maxillary fissure to the internal maxillary and deep parotid lymph glands. The posterior group of spaces contains the Hyaloid canal which extends from the optic disc to the posterior pole of the lens, draining the inter-vaginal space of the optic nerve. In addition there is in this group the perichoroid lymph space whose lymph empties into the Tenon space "by perforation in the sclera around the venae verticose." Tenon's space which empties into the supra-vaginal space, and the inter-vaginal space complete the list, the last mentioned of which opens into the subdural and subarachnoid spaces of the brain.

According to Deaver, any obstruction in the anterior lymph channels will cause an increase in intra-ocular pressure. For example, such conditions as annular posterior synechia, involving the entire pupillary margin of the iris to the extent of causing it to adhere to the anterior surface of the capsule of the lens will prevent the lymph of the posterior chamber from entering the anterior chamber through the pupil. This would result in causing the iris to project against the cornea, closing off the drainage through the spaces of Fontana and the canal of Schlemm. Such a serious condition gives rise to a symptom complex known as

glaucoma. In addition to this, glaucoma may result from a hypersecretion of lymph in the eyeball. I am of the opinion that many cases of glaucoma which we are treating today with good results are of this type.

In summarizing, therefore, we have a triple lymphatic drainage from the eye by way of first, the eyelid, through the buccal and submaxillary lymph glands of the head to the superficial lymph glands of the neck. Secondly, this drainage is by way of the anterior lymph channels of the eyeball (canal of Schlemm and spaces of Fontana and anterior posterior chambers) all draining to the internal maxillary lymph glands. The third avenue of drainage is by way of the posterior channels of the eyeball (Hyaloid canal, supra- and infra-vaginal lymph spaces and perichoroid lymph space) all draining to the subdural and subarachnoid spaces of the brain.

The Ear

The ear proper is divided into three parts, the External ear, Middle ear, and Inner ear, each having a distinct lymphatic drainage. The lymphatics of the external ear drain into the parotid and the superficial cervical lymph glands. Infections of the external ear manifest themselves by tenderness in the parotid lymph glands, maxillary lymph gland or superficial lymph glands of the neck. The Middle Ear is drained by the lymphatics which pass out through the external auditory canal to join the superficial lymph glands of the neck. Lymph vessels also pass down the lymphatic system of the neck. The lymph of the Inner Ear communicates with the subdural and subarachnoid spaces of the brain.

Summary

In conclusion, it is to be noted that the eye and the ear have a somewhat correlative system of lymph drainage. This drainage includes the subdural and subarachnoid spaces of the brain which are partia terminals of the drainage of the more intricate structures of the organs. So far as the superficial and deep drainage of the neck is concerned, the facilitation of this drainage is brought about by the deep relaxing of the region of the clavicle and first rib. By so doing the drainage is "freed," as we say, that is, there is brought about an actual minute increase in the intervascular spaces allowing for the greater flow of blood and lymphatic fluid because of the mechanical as well as chemical changes which become possible.

The muscular relaxation which is involved in the process helps to lift the mechanical pressure which by tightening of the fibres has brought

about contracture of the whole region. In addition to this there is accomplished a metabolic process of repair of the cells which, because of interference with drainage and nutrition, have become over-laden with toxic products such as CO_2 and other substances. By virtue of the "freeing up" process this intracellular drainage is accomplished and the intercellular accumulation of edematous material is allowed to flow more freely downward to the subclavian vein.

Therefore, the clavicular work is indicated in general introductory work for all cases involving the lymphatics of Eye and Ear. It should not be considered as purely introductory, for it will be well in all cases of inflammation of either organ to continue the clavicular treatment as long as indicated for drainage.

The special treatment as originated by Dr. Edwards for local freeing of the lymph is of great value after the general freeing of the deep and superficial lymph drainage of the neck. Treatment at the first, second and third lumbar helps to open the cerebrospinal lymph drainage thus clearing the way for the special local treatment of the inner ear.

J. DEASON, M. S., D. O.

CHICAGO, ILL.

CHAPTER TWELVE

LYMPHATIC DRAINAGE OF THE HEAD AND NECK

J. Deason, M. S., D. O.

Physiologic Properties of Lymph

To understand fully the function of an organ requires not only that we understand its histologic and gross structure and the relation of these to the work it has to do, but we must also understand the structural and functional relations of this organ with other similar organs.

Anatomically, lymph vessels are similar to veins of the blood-vascular system in that they are thin-walled and serve as drainage channels, but they are unlike veins in that they drain intracellular spaces and serous sacs. They are also unlike veins in their abundant interlacing anastomoses and the interruption of their continuity by lymph glands or nodes. By virtue of this construction lymph vessels serve as drainage channels from many parts not drained by the venous system.

Lymph vessels, therefore, serve a transitional function between intracellular spaces and veins as they serve to collect the fluid from the intracellular spaces and return it to the veins. Lymph vessels may be thought of as the primary or first structures of circulation. Lymph vessels bear a similar relation to the veins that the veins bear to arteries, and all of these, in order, efferently, the arteries, veins, and intracellular spaces, and afferently, the intracellular spaces, lymph vessels and veins, constitute the essential circulatory mechanism and each is important in carrying nutrition to and waste products from the cell, which is fundamentally the unit of function.

Physiologically, lymph performs an important protective function by virtue of its phagocytic cells and antibody content; a nutritional function by virtue of its supply of nutrient material and drainage of cell waste from tissue spaces; and a tissue fluid balance function because of its osmotic properties. The lymphatic system, structurally and functionally, bears a relation to the veins similar to that which the veins bear to the arteries.

General Anatomy

Lymphatic vessels of the head and neck are distinguished as superficial and deep. The former drain the subcutaneous tissues and superficial muscles of the face and scalp and terminate in the superficial glands of the neck. The deep vessels are those which drain the deep muscles, the nasopharyngeal structures, sinuses and glands, the oropharynx and

contents, the orbit and contents, larynx, esophagus and trachea. These empty into various groups of deep glands which form a belt about the neck.

Intracranial lymph vessels from the brain and meninges follow the courses of the arteries and veins and empty into the deep cervical glands.

Groups of Deep Cervical Glands

PAROTID LYMPH GLANDS.—These glands are superficial and deep, the superficial being located just beneath the fascia, and the deep imbedded within the parotid gland. The superficial glands receive afferent vessels from all anterior superficial parts of the scalp and face including the external ear. Swelling of these glands may result from infection of any of the parts drained. Efferents of these glands drain into either superficial or deep cervical glands, which explains why a deep cervical swelling may result from superficial infection.

The deep parotid lymph glands receive afferent vessels from the external meatus, tympanum, soft palate, and posterior nares. Efferent vessels drain into the upper deep cervical glands.

APPLICATION.—The swelling and tenderness of these glands, together with ear pain, is quite diagnostic of infection of the middle ear. Infections of the external ear are not so likely to cause lymphatic swelling because there is usually free drainage.

Infections of the nasopharynx and posterior nares cause glandular enlargement and these structures are nearly always involved in suppurative otitis media.

"The deep part of the parotid gland is lodged in a definite space behind the ramus of the lower jaw. This space is increased in size when the head is extended, and when the inferior maxilla is moved forward, as in protruding the chin." (Treves). This explains why pain is caused by all movements which tend to decrease the space of this gland, such as chewing, swallowing, etc.

The superficial part of the gland lies over the masseter muscle and the whole gland is invested in a fascial sac derived from cervical fascia. The opening of the upper part of this sac is exposed to infections from postpharyngeal abscess, which explains the common occurrence of pharyngitis and parotiditis.

In otitis media, pharyngitis, postnasal, nasopharyngeal, and tonsil infections, in addition to other treatment, it is essential that lymphatic drainage of the parotid lymph glands be established and maintained. Deep drainage treatment may be done by direct relaxation behind and under the angles of the jaws with the head well extended. By forcing the

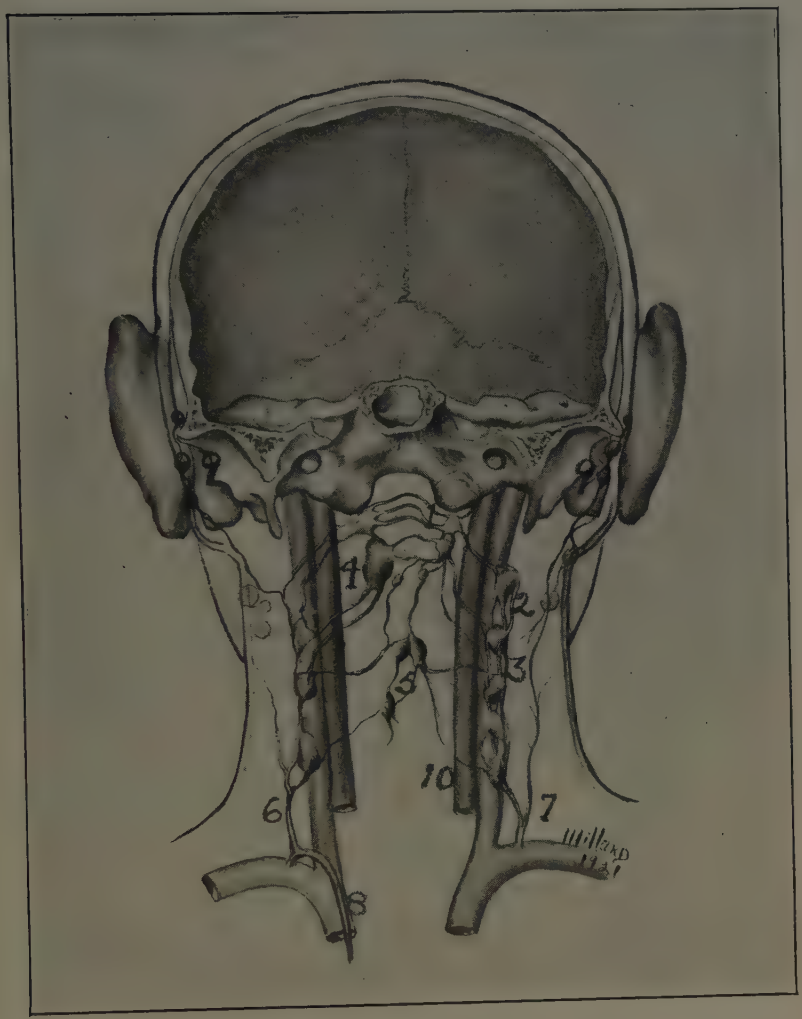

PLATE XLVIII. Lymphatics of the Pharyngeal Region.—(1) Nodes back of pharynx. (2 & 3) Deep cervical nodes. (4) Retro-pharyngeal node. (5) Tracheal nodes. (6) Lymph vessels entering thoracic duct. (7) Right lymphatic duct. (8) Thoracic duct. (9) Mastoid nodes. (10) Carotid artery.

head and jaw backward thus compressing these glands and again extending and repeating the direct deep drainage treatment, the glands and vessels may be "pumped" and made to increase their function of drainage. Except in acute inflammatory conditions, direct stretching of the soft palate and dilatation of the posterior nares by means of the fingers are effective; also exercises for draining the cervical lymph glands and exercising the muscles of the neck are effective.

It is important to remember that the fascial sac covering the parotid gland is closed except at its upper part, and that swelling of the gland and coverings retard drainage. Heat applied intermittently, which may be accomplished best by means of an electric pad or lamp with reflector, produces capillary dilatation and contraction and materially assists in increasing drainage from the gland. Bier's hyperemic treatment may be done by placing a tight bandage immediately beneath the glands until the face is flushed and the vessels are engorged. The bandage is then removed, the head extended, and the deep manipulative treatment behind and under the angles of the jaws causes an effective and quick drainage. This flushing treatment may be repeated several times daily with good effect.

POSTPHARYNGEAL LYMPH GLANDS.—These glands are located posterior to the walls of the pharynx, and anterior to the first and second cervical vertebrae. They receive afferent vessels, from the nasal cavities and the nasal accessory sinuses, from the nasopharynx, pharyngeal tonsil, Eustachian tube, the middle ear, and other adjacent deep structures. Since these structures are so commonly the source of infection, the postpharyngeal glands are often involved and retro-pharyngeal abscess, with its various complications, is not uncommon. Efferent vessels of these glands drain into the deep cervical lymph glands, therefore involvement of the cervical glands frequently results from infection of the various structures named above.

APPLICATION.—The abundant anastomoses of the lymphatic vessels and the fact that lymph flows rather freely in any direction, explains the common extension of infections from a glandular center. Extension of infection from the postpharyngeal glands, involving the various structures of the pharynx, larynx and oral cavity, is common. This explains why tonsillitis, pharyngitis, and even infections of the gums, may result from sinuitis or an infected nasopharynx, which is common, and this explains why tonsillitis may often be relieved by removal of the adenoids and the proper treatment of the nasopharynx, sinuses and nares. Inflammatory (catarrhal) diseases of the Eustachian tube and middle ear frequently result from infections of the nasopharynx, adenoid

growths or adhesions resulting from their incomplete atrophy, intranasal or sinus infections, and the source of this inflammation must be successfully treated before the ear affection can be controlled. Extension of inflammation along the walls of the Eustachian tubes from pharyngeal infections is the most common cause of catarrhal deafness. Tonsillar infection is the primary cause of pharyngeal infection in some cases, but from the evidence given above and from clinical observation, I believe that sinus, intranasal and nasopharyngeal infections are more often the cause of ear trouble than is tonsillitis.

Any treatment which does not actually remove the cause of infection or physical irritation of the pharynx cannot be considered an efficient treatment for catarrhal deafness. Sinus infections, intranasal infections and definite obstructions to normal intranasal drainage must be properly treated. The same is true of intrapharyngeal obstructions and sources of infection. To crush adenoids or pharyngeal adhesions without actually removing every part that may interfere with postnasal drainage cannot produce the best results, because the source of the trouble has not been removed, and here is wherein the so-called "finger surgery" technic alone, fails to accomplish the best results. The direct treatment of the Eustachian tube and surrounding structures will result in partial and temporary results, only, unless the causes of inflammation are removed.

Persistent colds in the head, pharyngitis, laryngitis, voice impairment, etc., likewise are often caused and maintained by extension of infection from the postpharyngeal lymphatic glands, and the same principles of treatment apply.

In acute infections of the postpharyngeal glands, the same treatment as given above under "Parotid Lymph Glands," applies. However, in all acute infections it is a good rule to do no or very little direct treatment of the parts involved. There are exceptions to this rule, but, in general, it is a safe plan to follow because radical treatment may often result in an extension of the infection rather than relieve it.

Anterior Pharyngeal Lymph Glands

According to Treves, "Accessory glands, belonging to the thyroid body, are frequently found in the vicinity of the hyoid bone. They are also found in the basal part of the tongue, near the foramen caecum."

In many cases of acute disease the swelling of these glands like the postpharyngeal glands cause much soreness and discomfort. In tonsillitis, pharyngitis, etc., there is usually some affection of these glands. but, as stated above, direct treatment is not indicated during the acute

stage. Deep relaxation under the angles of the jaws externally will facilitate drainage. After the acute stage has passed, direct treatment may be done as follows: The two cornui of the hyoid are grasped between the thumb and second fingers of the left hand, palm upward, while the first and second fingers of the right hand are passed, palm downward, over the base of the tongue thus holding the hyoid firmly between these four fingers. The hyoid may now be lifted upward and thus by virtue of its attachment to the thyroid cartilage, the entire larynx may be lifted. The hyoid is held in this position for a few seconds, then pulled firmly forward and then downward and by these movements the pharyngeal constrictors may be relaxed and lymphatic and venous drainage accomplished.

In chronic pharyngitis and laryngitis this treatment will be found quite effective. To accomplish the desired results the purpose and technic of the treatment must be considered and the treatment must not be painful to the patient or the proper relaxation will not be accomplished.

Tonsils and Lymph Drainage

The group of lymphoid tissue commonly known as Waldeyer's tonsillar ring, consisting of faucial, lingual and pharyngeal tonsils, is frequently affected by infections carried through the lymph channels. The pharyngeal tonsils or adenoids are often involved secondary to sinus infections and the faucial tonsils are also frequently infected as a result of either adenoid, posterior nasal or sinus infections. In all cases of faucial tonsillitis it is essential to determine whether there is some infection above. Many cases of faucial tonsillitis will be entirely relieved by the proper treatment of the nasal accessory sinuses, posterior nasal chambers and the nasopharynx.

There is no positive evidence that the faucial tonsils have a function different from other lymphoid tissue, and since this tissue is usually excessive there is no reason why the tonsils should not be removed surgically so far as any loss of function is concerned when they are pathologically involved beyond restoration to normal, but because of reasons given above it is more logical to sacrifice the adenoid tissue first. Many cases of faucial tonsil involvement will be promptly relieved by adenoidectomy and the proper treatment of the entire nasopharynx sinuses.

Tubercular Tonsillitis

From the study of my cases I am convinced that tubercular infections of the tonsils is frequently secondary to tubercular sinuitis. To diagnose tubercular tonsillitis it is neceessary to first thoroughly clean

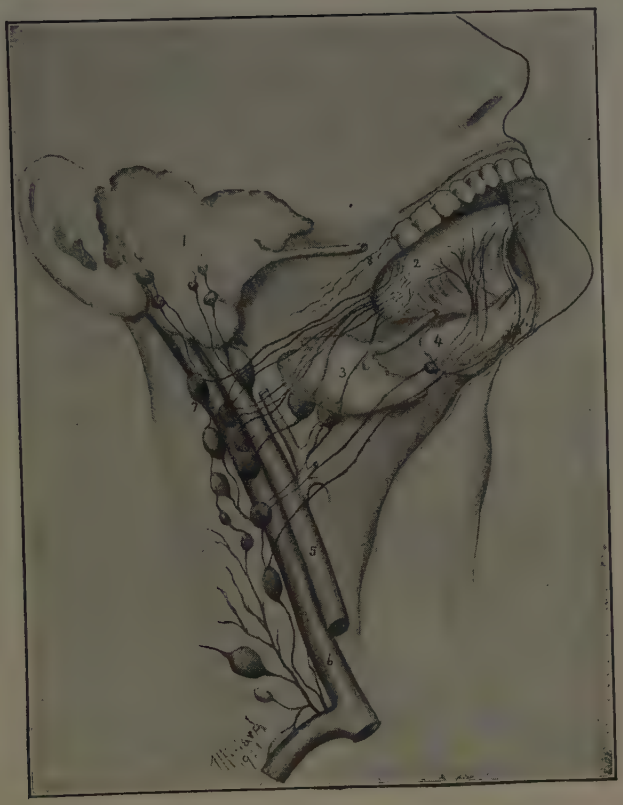

PLATE XLIX. Lymph Drainage of Throat.—(1) Parotid gland and nodes. (2) Three-fold drainage by lingual lymphatics. (3) Nodes in relation to submaxillary gland. (4) Lingual lymph vessels in relation to the sublingual gland. (5) Carotid artery. (6) Internal jugular vein. (7) Nodes collecting lymph from teeth, gums and tongue. (8) Lymphatic vessels collecting lymph from the gums.

the entire pharynx by irrigation, swabbing and gargling and then obtain pus from the crypts of the tonsils by cupping or by means of probing deeply into the crypts and making stains of the pus thus obtained.

The tonsils may be the primary source of tubercular infection but a tubercular infection of the tonsils is rarely confined to that locality long. There is usually evidence of an extension to the sinuses, lungs or cervical lymph glands and when there is an active involvement of any of these other structures it is essential to arrest the active infection in the lungs, sinuses or lymph glands before advising tonsillectomy.

J. D. EDWARDS, D. O., M. D.
St. Louis, Mo.

CHAPTER THIRTEEN

FINGER SURGERY IN THE TREATMENT OF THE LYMPHATICS OF THE EYE, EAR, NOSE AND THROAT

JAMES D. EDWARDS, D. O., M. D., St. Louis

In the study of the lymph drainage of the eye, ear, nose and throat we are opening one of the most fascinating chapters of Osteopathy, a subject of which our knowledge is still so limited that it is as but a minute scratch upon the veneer. The first productive stimulus to this subject was created by the theory of fermentation of the lymph in the lymphatics as propounded by the "Old Doctor" (Dr. A. T. Still) and subsequently developed by Dr. F. P. Millard. In the early days of Osteopathy the "Old Doctor" expressed the opinion that each lymphatic created a specific substance, which is discharged into the blood, and that these substances are necessary to the integrity of the organism. The frequent references to the humors and refluxes of earlier writers indicate that they had a preconceived notion of the lymphatics, the nature and source of which were at that time bound up in apparently unfathomable mystery.

It is to the physiological chemist that we must look for the development of our knowledge of this most intricate subject. The gross and histological anatomy as well as the pathology of the structural elements of the lymphatic system have been quite thoroughly investigated, but there is still a vast amount of work to be done in isolating and determining the remarkable properties of the active principles of the lymph drainage. The clinical progress of the subject has within past years, and particularly of late, made rapid strides forward, and an ever-increasing interest and enthusiasm stimulated in those who have become initiated in this most fascinating phase of clinical study.

The subject matter of this chapter is, in brief, a repetition of what hav e peviously expressed as clinical observations, which have been so forcibly verified by personal clinical experience as to create an interest in a subject which solves many of the innumerable problems incident to the practice of Osteopathy. It is my purpose to limit my remarks to the important relationship existing between the lymphatics of the eye, ear, nose and throat, and the diseases treated by the osteopathic ophthalmologist and otolaryngologist. An understanding of this phase of physiology, in its normal and abnormal reactions, is of paramount im-

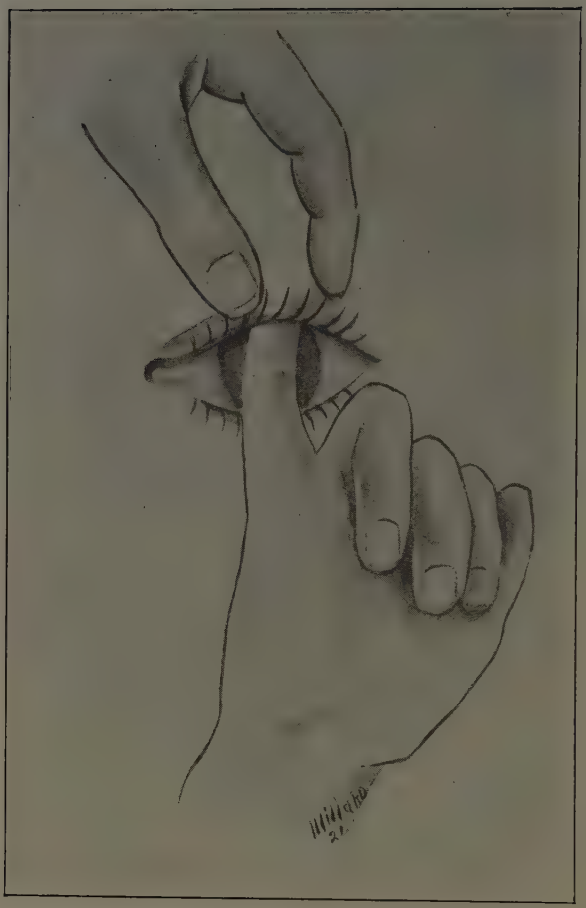

PLATE L. Finger surgery of the upper lid in the treatment of external diseases of the eye. The little finger of the right hand is stretching and relaxing the upper lid, while the thumb and forefinger of the opposite hand are rolling the tarsus over the inserted finger.

portance, and serves an incalculable aid in the analysis and treatment of the upper orifices.

Disgruntled osteopaths, feeling the ground slipping from under their feet, have shouted against the various methods which in recent years have forged to the front. They have intimidated the credulous by attributing to the men interested in the specialties statements which were far beyond any assertions that have been made, and in the same unreasonable manner they continued destroying the house of their own creation. Strong-arm osteopaths, clinging to set classifications and trustworthy manipulations, have protested against the invasion of the osteopathic specialist. Frequently, fearful of revealing their own conflicts and shortcomings, they assailed the process as injurious and costly. They shook their heads solemnly and told how pernicious it was for the recent graduate to enter the specialties.

They stated that dilatation of the pharyngeal orifice of the Eustachian tube was not feasible, and they sometimes denied the efficacy of a curettage of the fossa of Rosenmuller. How could there be such a thing as a palpable Eustachian orifice when it was all one could do to understand the workings of the auditory apparatus?

It is easy to recall the time when anatomists, in their search for truth, were persecuted and regarded as enemies to society. While our present status in regard to finger surgery is nothing about which to boast, nevertheless it is a relief to know that this sort of cowardice has not manifested itself to a sufficient degree to halt the chariot of progress.

Lymph Drainage of the Eyelids

There are two networks of lymphatics which follow the corresponding veins. The networks are connected by vessels which pierce the tarsus. The lymphatics empty into the submaxillary, preauricular, and parotid lymphatic glands. The preauricular gland is often enlarged in diseases of the lids.

In blepharitis marginalis, chronic catarrhal conjunctivitis, trachoma, dacryocystitis, chalazion, hordeolum, and other infections it is essential that lymphatic drainage of the tarsus be re-established. Finger surgery of the upper lid, in addition to structural adjustments, has worked wonders in the treatment of external diseases of the eye.

To treat the upper lid, the nail of the little finger should be trimmed below the cushion, and the phalanges thoroughly cleansed and lubricated with some mild antiseptic fluid. (Incidentally, I may remark that I have found the "Williams antiseptic fluid" very efficacious in this technic). The first phalanx of the little finger (palm upward) is gently

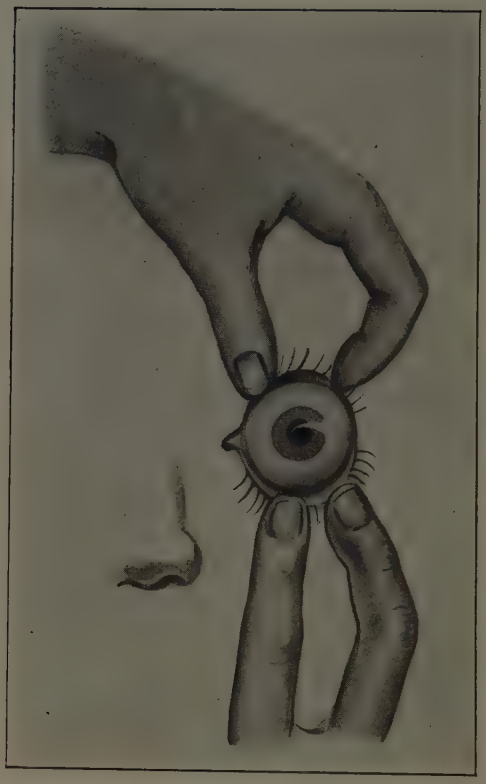

PLATE LI. Finger surgery of the ocular lymphatics (first step). The forefingers of both hands are retracting and depressing the upper and lower lids as the globe is gradually lifted out of its cavity and upon the rim of the orbital fossa.

passed beneath the upper lid, upward and backward, to the supraorbita space. The thumb and forefinger of the opposite hand supports the upper lid, feeding it over the little finger during the insertion. The interference and purchase power of the inferior palpebra can be avoided by depressing the lower lid with the index finger of the left hand, and as this is done the little finger of the right hand will pass into space. The thumb and forefinger of the opposite hand, resting upon the upper lid, act as a fulcrum and guide, and, by raising the hand of the inserted finger (the phalanges being held rigid), the traction is referred to the inner and outer canthus, and the tarsus is treated by rolling the upper lid over the inserted finger. (Plate 50).

A few drops of a two-per cent. solution of holocain or alypin, allowed to remain a few minutes, will very readily anesthetize the tissues, and the little finger can be inserted with very little discomfort to the patient.

An instillation of a fifty-per cent. solution of alkalol (not alcohol), a few drops in each eye, is used as a prophylactic measure following each treatment. The alkalol is very soothing, and will not discolor the conjunctiva like instillations of the silver salts (argyrol).

The Ocular Lymphatics

Lymphatics have not been found in the cornea. In the conjunctiva, lymphatic vessels are present. Elsewhere in the ocular structures their places are taken by lymph spaces, which form two systems—an anterior and a posterior.

Ball says that the lymph from the anterior segment of the globe collects in the anterior and posterior chambers, whence it passes through the ligamentum pectinatum into the canal of Schlemm. From this channel it passes into the anterior ciliary veins.

The posterior lymph spaces are: (1) The hyaloid canal; (2) the perichoroidal space, situated between the choroid and sclera, and communicating by means of spaces around the venae vorticosae with (3) the space of Tenon, which lies between the sclera and Tenon's capsule. From these points lymph collects and passes into (4) the intervaginal space found between the sheaths of the optic nerve and (5) the supravaginal space which surrounds the sheath of the same nerve. Lymph spaces surround the retinal veins and capillaries and probably the arteries. Occlusion of the anterior lymph space is one of the phenomena of glaucoma and nothing is known concerning occlusion of the posterior spaces. (B).

In the treatment of glaucoma, optic nerve atrophy, choroiditis, cataracts, and other nonsuppurative processes, finger surgery of the

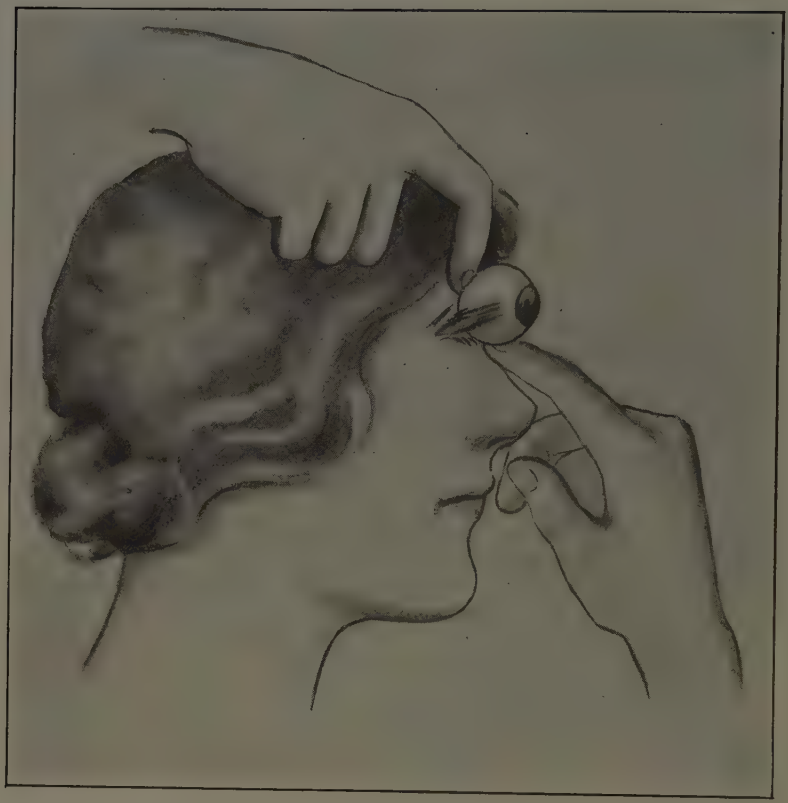

PLATE LII. Finger surgery of the ocular lymphatics (second step). The forefingers of both hands are elevating and dislocating the eyeball, thereby bringing traction upon the optic nerve, and relaxing the musculature and deep tissues of the orbital cavity.

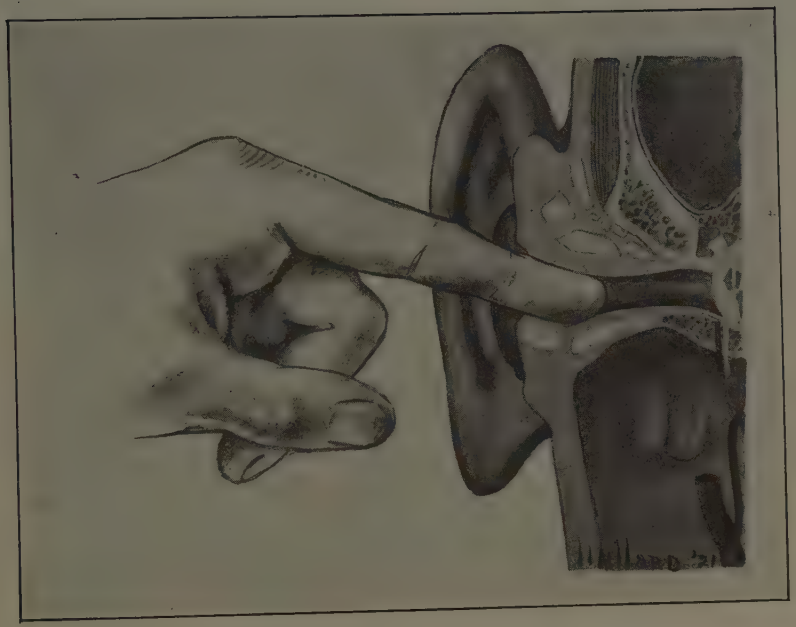

PLATE LIII. Finger surgery of the external auditory meatus. The forefinger is dilating the meatus in the treatment of the lymphatics of the auricle and canal.

globe is the technic par excellence. Frequently, where only failure results from other modes of therapy, excellent results are obtained by this new osteopathic treatment of the ocular lymph spaces.

In the treatment of the ocular lymphatics the writer elevates and dislocates the eyeball, the forefingers of both hands retracting and depressing the upper and lower lids as the globe is gradually lifted out of its cavity and upon the rim of the orbital fossa. The eyeball is allowed to remain in this position until there is a marked injection of the conjunctiva, indicating a change in the vascular supply. The orbit is easily replaced by releasing the lids, applying careful and steady pressure on the sclera and a slow rocking movement to the globe. (Plates 51, 52).

These manipulations will relax the musculature and deep tissues of the orbital cavity, re-establish the lymph spaces, filtration angle, and normal exits, correct the physiologic astigmatism, which is due to lid pressure, and adjust the axial ametropia, which is due to malalignment of the extrinsic muscles.

A few drops of a two per cent. solution of holocain or alypin, allowed to remain a few minutes, will very readily anesthetize the tissues, and the eyeball can be elevated and dislocated with very little discomfort to the patient.

I have administered this local manipulation of the eyeball three times a week for six months or more, and it is very gratifying to see the globe change from a passive to an active congestion and observe the elimination of the orbital discomfort, with marked improvement in vision and often with the complete removal of the glasses. The structural adjustments (osteopathic lesions) were, of course, the supportive measures in every case.

Lymphatics of the Auricle and External Auditory Canal

The lymph drainage of the pinna and external auditory meatus is very closely associated with the lymphatics of the mastoid process and parotid gland. Inflammatory affections of the external meatus will, as a rule, invade the lymphatics of the neighboring tissues. Politzer says that the lymphatics of the anterior and superior walls of the meatus, the tragus, and the surrounding parts empty into the preauricular glands (on the parotid); that those of the lobule, the helix, and the inferior walls of the meatus empty into the infra-auricular glands (in the angle of the jaw); that those of the antihelix and the concha empty into the mastoid glands (on the apex of the mastoid process); and that those of the posterior wall of the meatus, together with those of the Eustachian tube, empty into the deep cervical and retropharyngeal glands. The tym-

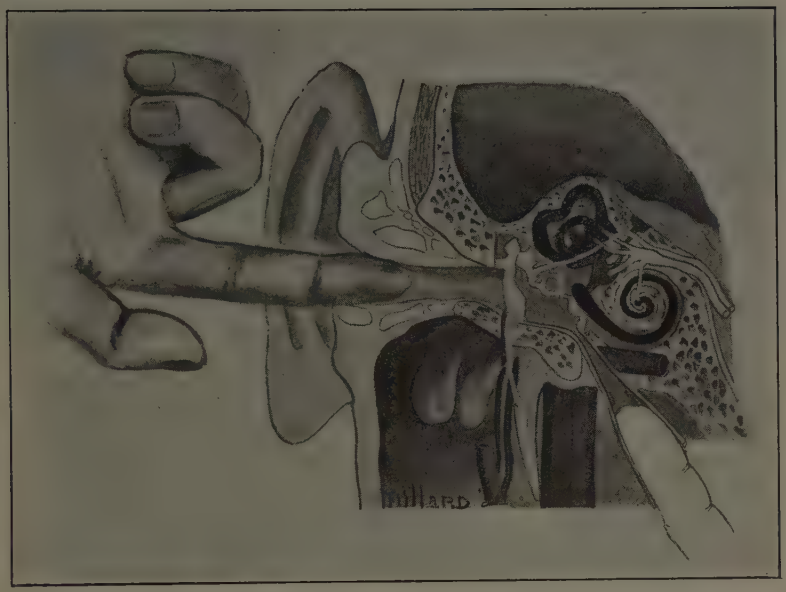

PLATE LIV. Millard's bimanual technic. The forefinger of the right hand is dilating the right external auditory canal, while the forefinger of the left hand is dilating the pharyngeal orifice of the right Eustachian tube (same side), in the treatment of catarrhal deafness. The lymphatics at both ends are treated at the same time, and the peripheral inhibition stimulates the center.

PLATE LV. Lymphatics in the walls of the pharynx with the view looking forward to the posterior nares from the cervical vertebrae position. The lymphatics have been separated from the membranes. The forefinger is dilating the right Eustachian orifice. This cobweb picture is very unique, and is shown for the first time in any text.

panum is drained by the lymphatics, which pass out through the external auditory meatus to join the superficial glands of the neck. The lymph drainage of the labyrinth is closely associated with the subdural and subarachnoid spaces of the brain.

Finger Surgery of the Auditory Lymphatics

In addition to structural adjustments (mandibular, clavicular, cervical, and upper-dorsal), digital dilatation of the external auditory meatus is an adjunct par excellence in the treatment of diseases of the external auditory canal, drumhead, and tympanum. Otitis externa circumscripta and diffusa, tinnitus aurium, myringitis, and catarrhal deafness have responded to this local manipulation.

Before attempting a digital dilatation, the canal should be carefully examined for foreign bodies, be freed from wax, and dry swabbed. The index finger should be thoroughly cleansed, with nail trimmed below the cushion, and not lubricated.

To enter the external auditory meatus, the operator stands at the head of the table, with the patient in a recumbent position. The index finger (palm upward) is slowly and carefully inserted, and directed upward and backward, with gradual rotation, from the operator toward patient's shoulder. During the rotation, which is the "knack" of the technic, the operator should not use his wrist, but slowly lean forward as the finger passes upward and backward into the canal. The finger should not be instantly withdrawn, but allowed to remain a minute or two in location, and the technic should be repeated several times at each treatment. (Plate 53).

To properly dilate the external auditory meatus requires, as a rule, from six to twelve treatments, but this technic should not, however, be administered more than three times a week. It will often be found difficult to enter the canal, but slow and careful insertion, with gradual rotation, will allow the tissues to accommodate themselves without surgical trauma. Immediately following the dilatation of the external auditory meatus, there will be a marked injection of the drumhead—acute myringitis—which is readily seen with the myringoscope. The active hyperemia thus produced flushes the tympanic membrane and ossicular chain, breaking up the low grade ossicular synovitis, tightening the overrelaxed drumhead, and releases the impingement of the lymph drainage of the external auditory canal and membrana tympani.

The bimanual treatment as originated by Dr. F. P. Millard—dilatation of the pharyngeal orifice of the Eustachian tube and external auditory meatus—as reported in the Journal of the American Osteopathic

PLATE LVI. Posterior nasal spaces and lymph drainage of muscles of palate and pharynx. (1) Levator veli palatini; (2) tensor veli palatini; (3) pharyngo palatinus; (4) stylo pharyngeus; (5) digastricus.

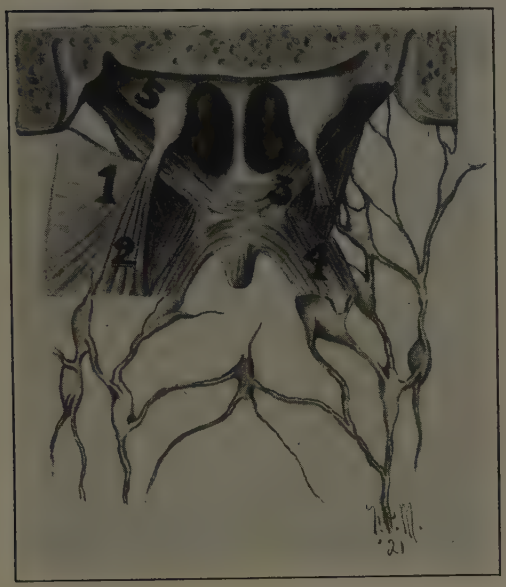

PLATE LVII. Musculature of the pharyngeal orifice of the Eustachian tube and lymph drainage of the palate. (1) Superior constrictor of the pharynx; (2) salpingopharyngeus; (3) levator veli palatini; (4) pharyngopalatinus; (5) tubercle of Gerlach (tube tonsil). During the act of deglutition, and as the soft palate elevates, the tube tonsil comes forward and overrides the Eustachian orifice, thereby preventing the regurgitation of foreign substances into the Eustachian canal—epiglottis of the tube.

Association (July, 1918), is now used by the writer, and is very efficacious in the management of catarrhal deafness. (Plate 54).

The Eustachian Lymphatics

The pharyngeal orifice of the Eustachian tube is situated on the lateral wall of the nasopharynx, nearly on a level with the horizontal prolongation of the inferior turbinate bone (turbinate body). It is an oval depression, with the appearance of a vertical slit, and measures about two-thirds of an inch in diameter. Numerous glands open into the tube near the orifice, and there also exists on its posterior lip a considerable amount of adenoid tissue, which constitutes the Eustachian cushion ("tube tonsil of Gerlach"). This adenoid mass is continuous with that of the nasopharynx (Waldeyer's ring), and is well developed in the early periods. (Plate 55).

The muscles which open and close this slit-like orifice are covered with mucous membrane, and form anteriorly the plica salpingopharyngeal and the plica salpingopalatine, which descend respectively from the lower end of the Eustachian cushion and from the anterior border of the Eustachian orifice to the soft palate and nasopharynx. (Plate 56).

The lumen of the cartilaginous portion of the Eustachian tube is entirely dependent on the proper relation of the muscles and tube tonsil. Between the tube tonsil and posterior wall of the pharynx is a recess—fossa of Rosenmuller—which is subject to great individual variations in size, and is rich in glandular tissue. Chronic nasopharyngeal catarrhs often give rise to cystic hypertrophy of the adenoid tissue and the formation of large gaps (pus pockets) and bridge-like bands in the Rosenmuller fossa, which may interfere with the function of the tube tonsil. Recent research has demonstrated conclusively that the Eustachian cushion (tube tonsil of Gerlach) is the epiglottis of the pharyngeal orifice of the Eustachian tube. (Plate 57). During the act of deglutition, and as the soft palate elevates, the tube tonsil comes forward and overrides the Eustachian orifice, thereby preventing the regurgitation of foreign substances into the Eustachian canal.

In the treatment of catarrhal deafness it was found, in many instances, that hypertrophy of the floor of the nasopharynx (soft palate) produced a recess at the pharyngeal orifice of the Eustachian tube, which, being filled with catarrhal exudates, functioned quite similar to a "plumber's trap," interfering with ventilation and drainage of the middle ear. Bearing in mind these anatomopathological conditions, it is readily seen that digital dilatation of the pharyngeal orifice of the Eustachian tube, digital curettage of the Rosenmuller fossa, and springing

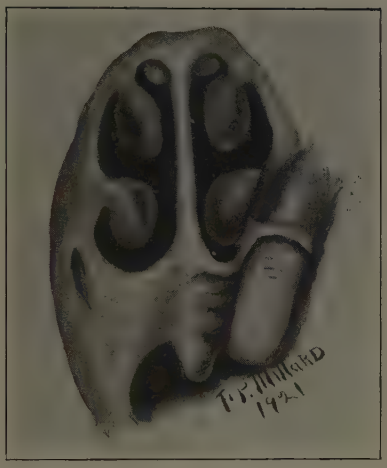

PLATE LVIII. "Lateral technic." The right forefinger is dilating the right Eustachian orifice, and illustrating the disadvantages of this manipulation. The cross technic is much easier, and will not tear the plicas or produce granulation tissue within the canal.

PLATE LIX. "Cross technic." The forefinger of the right hand is dilating the pharyngeal orifice of the left Eustachian canal, with the patient in a recumbent position. By turning this illustration upside down, the technic will be more easily understood. This has many advantages over the "lateral technic"—left orifice with the left finger, etc.

the soft palate (downward and forward) will release the impingement of the Eustachian lymphatics, drain the pus-pockets within the Rosenmuller fossa, and re-establish the normal ventilation and drainage of the tympanum.

Finger Surgery of the Eustachian Lymphatics

Clinical experience has demonstrated that, in order to reach the pharyngeal orifice of the Eustachian tube of the same side—i. e., the right orifice with the right finger and the left orifice with the left finger (lateral technic)—owing to the lost motion, purchase power, and leverage caused by the flexing of the phalanges and wrist-joint, it was very difficult in many instances to dilate the pharyngeal orifice, but this condition could be easily overcome by using a "cross technic." (Plates 58, 59).

To dilate the right Eustachian orifice, the left forefinger is passed behind the uvula upward and backward into the nasopharynx. The wrist-joint and phalanges being held rigid, the weight of the operator's arm will force the tip of the first phalanx into the pharyngeal orifice of the Eustachian tube. This cross technic will permit a much easier dilatation of the orifice without a tear in the plicas, which very often occurs in the "lateral technic," and thus avoid the accumulation of granulation tissue within the cartilaginous portion of the Eustachian tube, which retards the results of the operative procedure. The fossa of Rosenmuller should, however, be cleaned with the "lateral technic," and incidentally I may remark that Ballenger (1914 edition) in connection with this point uses the following language on page 684:

"Thomas H. Brunk first, and later W. S. Bryant, called attention to the presence of granulation tissue and adhesive bands in the Rosenmuller's fossa, claiming that their removal with the finger introduced through the mouth relieved tubal catarrh and deafness. Indeed, this opinion is attracting considerable attention, as the removal of these bands has in numerous cases been followed by improvement. The adhesive bands are frequently present, and should be searched for more frequently than has been customary."

On page 687 he says:

"If adhesive bands are present in the Rosenmuller's fossa, the index finger of the right hand should be introduced through the mouth and the right fossa thoroughly curetted with the nail. The left index finger should be used to curette the left fossa."

The operator, when manipulating the soft palate, should avoid touching the posterior pharyngeal wall, which, when disturbed, influences nausea and gagging, being the gagging center. The forefinger

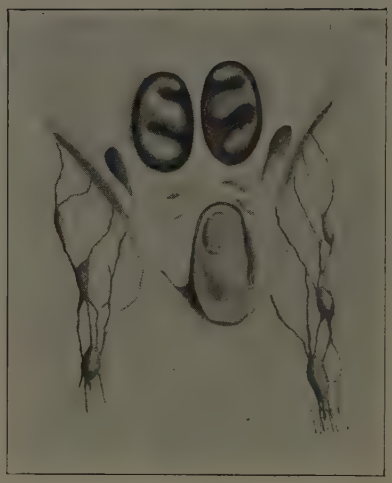

PLATE LX. Eustachian orifices, with posterior aspect of the turbinals, and their relation to the oral lymphatics. As the palate is sprung downward and forward, the traction is exerted upon the pharyngeal orifices and posterior nasal spaces.

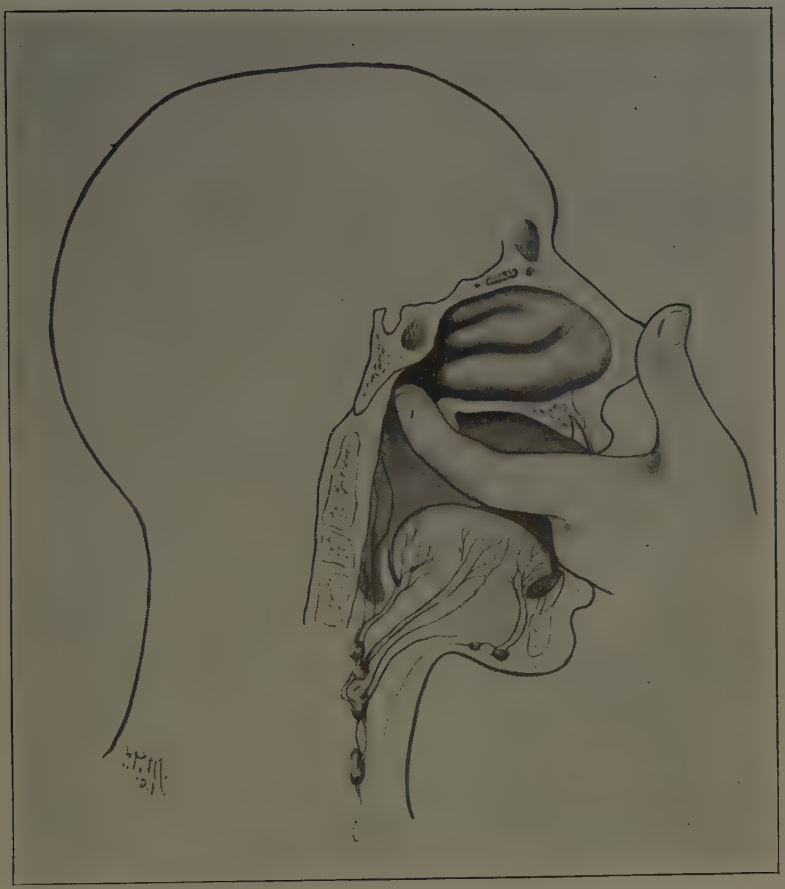

PLATE LXI. The forefinger is springing the soft palate, downward and forward, forming an acute angle with the hard palate. The operator should avoid touching the posterior pharyngeal wall—the gagging center.

should be passed to the lateral aspect of the uvula, then gently behind the velum pendulum palati, and upward and backward into the nasopharynx. While forcibly springing the soft palate, the traction should be exerted upon the lateral muscular portion, and not the raphe of the velum. Traction exerted upon the uvula or raphe of the velum will have little, if any, effect upon the walls of the nasopharynx. The muscular portion should be forcibly sprung downward and forward, forming an acute angle with the hard palate, and held in this position a minute or two. This will influence the lymph drainage and eliminate the passive congestion within the lateral nasopharyngeal walls. (Plates 60, 61, 62).

Lymphatics of the Nasal Cavity

The lymphatics of the nasal cavity form an irregular network in the superficial part of the mucous membrane, and can be injected from the subdural or subarachnoid space. The larger vessels are directed backward toward the choanæ and are collected into two trunks, of which the larger passes to a lymphatic gland in front of the axis vertebra and the smaller to one or two glands situated near the great cornu of the hyoid bone. (Cunningham).

Most of the lymphatics of the nasal fossa enter the retropharyngeal glands placed behind the pharynx, in front of the rectus capitis anticus major, and hence retropharyngeal abscess may arise in consequence of diseases of the nose. Other lymphatics go to the submaxillary, parotid, and upper deep cervical lymph glands, and it is common to find these enlarged in nose affections, especially in those of a scrofulous nature. The lymphatics of the nose also communicate with those of the meninges through the cribriform plate. (Treves).

Finger Surgery of the Nasal Lymphatics

Digital dilatation of the posterior nares by means of the index finger, and anterior nares with the little finger, is very efficacious in the re-establishment of the lymphatic drainage of the nasal cavity. The writer uses this technic, in addition to structural adjustments, in the treatment of catarrhal deafness, hay fever, otitis media, pharyngitis, and other diseases of the upper respiratory tract.

TECHNIC—Prepare the little finger by trimming the nail below the cushion and lubricate with some mild, oily antiseptic (KY) lubricant, or Williams' fluid is very good. A five per cent. solution of holocain or alypin in adrenalin chloride 1:1000 will very readily anesthetize the tissues, and the finger can be passed with very little discomfort to the patient. The anterior and posterior nares are sprayed with either of these solutions and allowed to remain from ten to fifteen minutes.

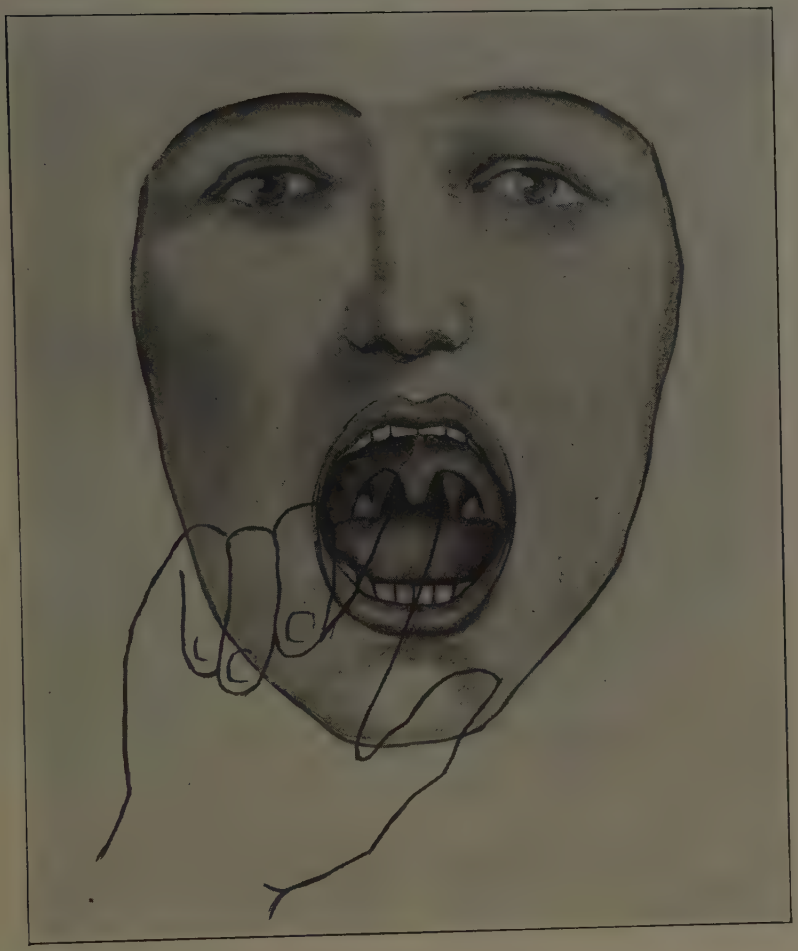

PLATE LXII. Finger surgery of the oral lymphatics. The forefinger of the right hand is passed behind the uvula, upward and backward, into the nasopharynx, and the soft palate is sprung, downward and forward, being held in this position from one to two minutes.

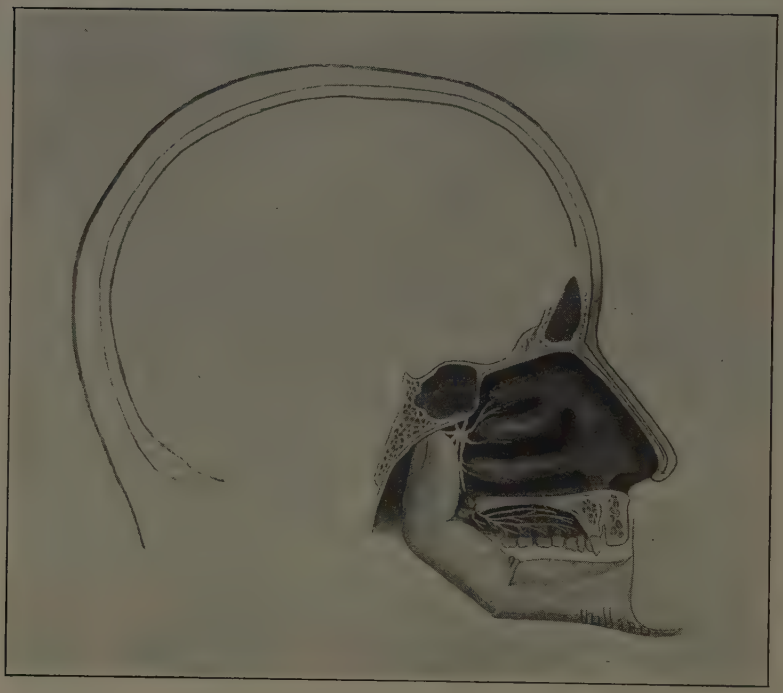

PLATE LXIII. Finger surgery of the sphenopalatine ganglion. The forefinger is passed behind the uvula, upward and backward, into the nasopharynx, and forced as far as possible into the posterior nasal spaces. The ganglion is manipulated with the tip of the first phalanx.

When inserting the little finger into the anterior nares (palmar surface upward), the first phalanx should be directed upward and backward into the olfactory area, and by a gentle, passive manipulation the "epinaris" will be dilated. The finger should then be lowered and directed back into the posterior nares and rotated several times, thereby relaxing the lateral tissues of the nasal cavity, which will release the obstructions to the lymph drainage. To dilate the posterior nasal spaces, the index finger of either hand should be introduced through the mouth, behind the uvula, upward and backward to the vomer. The finger should be forced as far as possible into the posterior nasal spaces, while in situ the posterior aspect of the inferior turbinate (turbinate body) may be manipulated. The functional hypertrophy of this turbinal is, in many instances, the cause of nasal stenosis.

SPHENOPALATINE GANGLION.—This ganglion may be manipulated while dilating the posterior nasal spaces. Meckel's ganglion is situated in the tissue which is directly beneath the nail of the operator's forefinger —patient in the recumbent position and operator's index finger forced as far as possible into the posterior nasal spaces. By pressing the nail of the forefinger firmly downward, the purchase power will be referred to the ganglion, which is only a few millimeters beneath the mucosa. (Plate 63). This technic has proved very efficacious in the treatment of tic douloureux, nasopharyngitis, hay fever, catarrhal deafness, asthma, and chronic bronchitis. By a study of its anatomical relations it is readily seen that the attention of this important ganglion will clear up many of the difficulties in the treatment of the lymph drainage of the nasal cavity and upper respiratory tract.

Lymph Drainage of the Oral Cavity

The lymphatic channels of the oral cavity pass into the lymphatic glands situated at the angle of the jaw, and this accounts for the enlargement of the glands here in certain affections of the nasopharynx. The lymphoid tissue is in scattered nodules, except on the lateral walls just behind the posterior pillars of the fauces, where a chain of lymph nodules runs vertically, connecting with the lymphoid tissue along the lateral walls of the nasopharynx. (Plate 64).

The mass in the neck, often mistaken for an enlarged tonsil, is formed of enlarged glands, situated near the tip of the great cornu of the hyoid bone, and overlying the internal jugular vein. These glands receive the tonsillar lymphatics, and are almost invariably enlarged in all tonsil affections. The oral lymphatics pass chiefly to the upper cervical glands. Those from the upper part of the posterior wall join a few postpharyngeal

PLATE LXIV. Lymphatics of the uvula, tonsils, and pillars of the fauces, and their relation to the lymph glands of the submaxillary and hyoid areas. The outlines in white are the structures treated by finger surgery in the management of voice alteration, nasopharyngitis, hay fever, and catarrhal deafness. Springing the soft palate, downward and forward, will re-establish the lymph drainage of the nasopharynx and posterior nasal spaces.

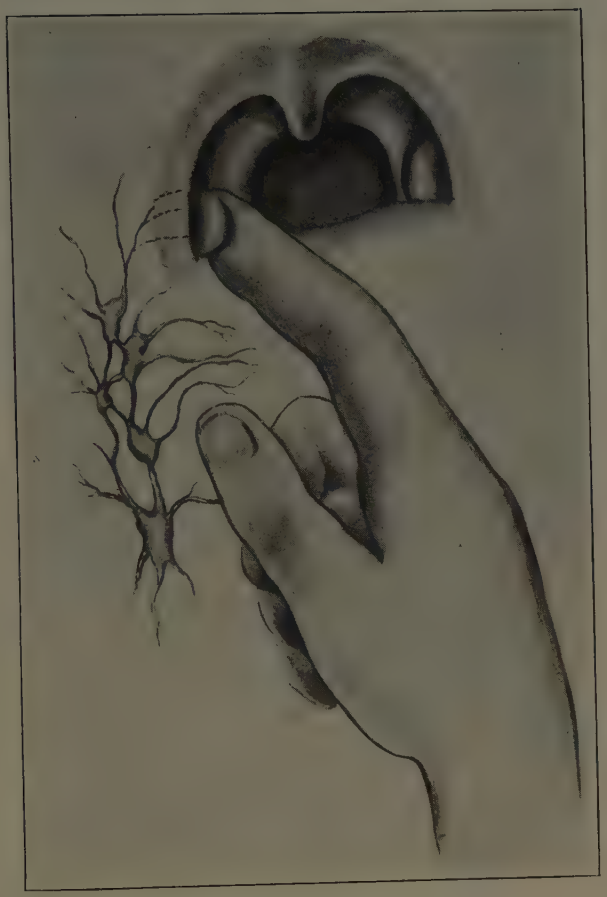

PLATE LXV. Diagram of the submaxillary glands and their relation to the tonsillar lymphatics. The forefinger is milking the tonsillar crypts.

glands, which are found on each side of the pharynx. The lymphatic glands of the neck drain the teeth, tonsils, adenoids, pharynx, and the mastoid region.

Finger Surgery of the Oral Lymphatics

The faucial tonsils are only a part of the lymphoid structures of the pharynx, and, owing to the continuity of this glandular chain, focal infections in neighboring lymphatic nodules are often the exciting factors in tonsillitis. (Plate 65).

To demonstrate that the pharynx is a source of these infections, I shall briefly review the anatomical relations of the lymphoid tissues in this region—the faucial tonsils, globular masses, situated between the anterior and posterior pillars of the fauces, on either side of the oropharynx; the mass of lymphoid tissue on the posterior pharyngeal wall, commonly called adenoids; the lingual tonsils, situated at the base of the tongue, on either side of the median line; and the lymphatic nodules on the posterior and lateral walls of the pharynx. This group of tonsils makes up the so-called "Waldeyer's ring," and, to my mind, this is the "Roman wall" of the throat, which acts as a protective agent to the respiratory tract during early childhood. Bearing in mind the four cardinal factors in bacteriology—namely, lowered resistance, avenue of entrance, virulence, and number—it is readily seen that any break in this wall of lymphatic nodules exposes the system to almost everything on the infectious disease calendar.

In considering this subject an effort is made not so much to direct attention to anything new in oropathology, but especially to consider the avoidance, as far as possible, of unnecessary surgery upon useful structures, and, most of all, to urge greater care in the matter of tonsillar diagnosis. (Plates 66, 67).

Masland, reporting his tonsillar research, says: "We see in the tonsil in the early years of life a startling picture of developmental change. In normal children, in connection with the lingual tonsils and the nasopharyngeal adenoids, this pharyngeal ring of lymphatics, "Waldeyer's" is always of considerable size. Prominent in early years, it undergoes a retrogressive change, but there remains always some lymphatic structure throughout the ring. The thought has come to me of the possible interrelation, either or both interactivation and interinhibition, between this structure and the thymus and the thyroid, particularly in the early years of life. How far this has been investigated, I do not know. Can we deny, then, that this pharyngeal lymphatic ring, over which pass all ingested liquid, solid, or gaseous material, does perform a vital function in the body economy?"

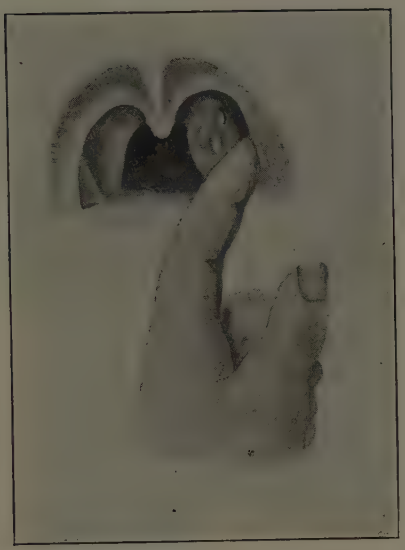

PLATE LXVI. Finger surgery of the tonsillar lymphatics in the treatment of chronic tonsillitis. The forefinger is separating the plica triangularis and anterior pillar of the fauces from the parenchyma, thereby releasing the impingement of the subdivisions of the tonsillar artery and venous drainage.

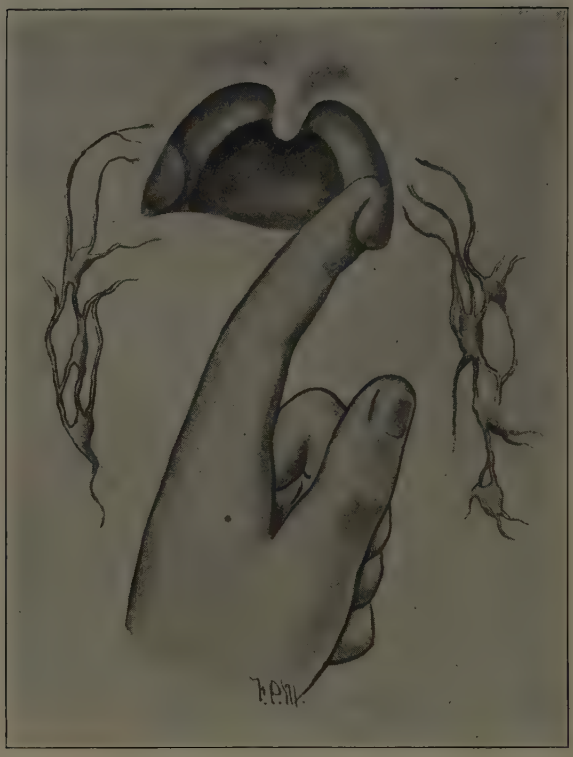

PLATE LXVII. Finger surgery of the post-tonsillar space. The forefinger is separating the posterior pillar of the fauces from the parenchyma.

EPIGLOTTIS OF THE TONSIL.—The function of the plica triangularis can be demonstrated very nicely by the insertion of a Holmes naso-pharyngoscope into the side of the mouth and observing the manipulations of the plica and pillars of the fauces during the act of swallowing. During the act of mastication and deglutition the plica triangularis is stretched across the tonsil, thereby preventing the food from packing the crypts. My experiments conclusively showed that the plica triangularis had a "shutter movement"—it would fold back into the anterior pillar of the fauces to allow the milking process of the crypts and then quickly stretch across the tonsil as the food approached it. The plica triangularis is unquestionably the "epiglottis of the tonsil," and, unless diseased, should not be removed in any instance. (Plate 68).

TECHNIC.—The author uses what is termed a "suspension technic," by which the tonsil is lifted from its infratonsillar fossa and held in this position for a minute or two. (Plate 69). This is easily done with no discomfort to the patient, by passing the index finger into the mouth and following the side of the tongue to the lower pole of the tonsil. The finger should not touch the posterior pharyngeal wall—the gagging center—and the manipulation should be restricted to the lower pole. With the cushion of the index finger the tonsil is gradually raised and held in suspension for a minute or two. In the bimanual manipulation counter pressure is made on the outside of the throat, at the submaxillary area, with the index finger of the opposite hand. The lingual tonsils and varix, situated at the base of the tongue, may be treated with the same finger, not forgetting, however, to avoid the gagging center on the posterior pharyngeal wall. This technic will re-establish the lymph drainage, function of the plica triangularis, and milking process of the tonsillar crypts.

The Lymph Drainage of the Larynx

The lymphatics of the larynx are of much importance with reference to voice alteration. The lymphatics above the cords empty into two or three trunks in the aryepiglottic folds, which pass through the thyrohyoid membrane to the glands on the internal jugular vein at the level of the upper border of the thyroid cartilage. A small gland is sometimes present on the thyrohyoid membrane, but appears seldom to be infected. The lymphatics below the cords leave the air-tube above and below the cricoid and empty into the lower deep cervical glands along the jugular vein. Some pass with the inferior laryngeal vessels to a peritracheal chain of glands; several minute glands may be found on the cricothyroid membrane and on the trachea, especially about the

PLATE LXVIII. Plica triangularis and its relation to the faucial tonsils. The plica is attached to the anterior pillar, and during the act of mastication it is stretched across the tonsil, thereby preventing the food from packing the crypts—epiglottis of the tonsil. In this illustration the plicas are functioning, and the tonsils can be observed behind this curtain effect.

PLATE LXIX. Finger surgery of the tonsillar lymphatics (suspension technic). The forefinger of the left hand is lifting the left tonsil from its infratonsillar fossa and holding it in suspension for a minute or two. This manipulation should be restricted to the lower pole, and the operator should avoid touching the posterior pharyngeal wall—the gagging center.

thyroid isthmus, but are rarely involved. The vocal cords themselves lie between these two systems; their lymphatics, which are remarkably small and scanty, pass to the upper set of vessels.

TECHNIC.—The index and second fingers are passed over the posterior aspect of the tongue—avoiding the gagging center—and directly into the epilarynx. The hyoid is treated by a rotary movement of the fingers and the epiglottis by a stretching of the epiglottidean ligaments. The middle ligament—a prominent mesial fold of mucous membrane—is often found to be indurated and resembling a tumefaction. A few treatments at this area will work wonders in "voice failures" and tickling throats.

As the fingers are withdrawn, the structures of the epilarynx and those at the base of the tongue are treated by a forward forcible manual traction upon the posterior aspect of the tongue. The cushions of the index and second fingers are placed just beneath the varix and lingual tonsils, and with this "purchase power" the tongue is forcibly lifted upward and forward and held in this position for a minute or two, which will re-establish the lymph drainage of the larynx, varix, and lingual tonsils. The external aspect of the larynx is supported by the opposite hand, bringing counter pressure and raising the larynx as the tongue is brought forward, the opposite hand being, of course, on the outside of the throat. This is one case where anesthesia, of any sort, is contraindicated, as the peripheral stimulation excited by the digital insertion and manipulative procedure is an important factor in the treatment. If the tissues are anesthetized, they lose this stimulating effect, and the treatment will not be as efficacious. This local manipulation of the larynx has worked wonders in the treatment of acute and chronic laryngitis, many vocal celebrities and famous orators have been returned to their professions by this treatment.

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CHAPTER FOURTEEN

A CONSIDERATION OF THE LYMPHATICS OF THE EYE, EAR, NOSE AND THROAT IN HEALTH AND DISEASE

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Lymphatics of the Nose

Except in the olfactory area, the nasal mucous membrane is characterized by ciliated columnar epithelium, interspersed with goblet cells that secrete mucus. Beneath the basement membrane of the epithelium is a layer of adenoid tissue that is particularly plentiful in children, and beneath this again is a layer of mucous and serous glands of variable sizes with ducts opening upon the surface. The fibrous stroma is dense in the deeper parts and forms the periosteum which is not firmly attached to the bone, but is quite easily peeled off. This must be guarded against. The cilia or hairs of the columnar cells act as scavengers, sweeping away debris, dust, bacteria, etc.. that have been trapped by the moist surfaces during the whirling of the inspired air. When the columnar epithelium is destroyed by atrophy, accident, electricity, or operation, it does not form again, but is replaced by squamous epithelium which does not moisten and sweep away the debris, resulting in the constant forming of crusts within the nose.

The mucous membrane of the nose is continuous anteriorly into the frontal, and maxillary sinuses and the anterior ethmoid cells, posteriorly into the posterior ethmoid cells and the sphenoid sinus, and it furthermore continues up through the lachrymal duct and is reflected over the eyelids and eyeballs as the conjunctiva. Posteriorly, also, it is continuous with the mucous membrane of the pharynx, Eustachian tube, middle ear, inner lining of the tympanum, mastoid cells and accessory cavities of the ear; also into the larynx, trachea, bronchi and alveoli; also into the esophagus and on through the entire gastro-intestinal tract, the pancreatic duct, the common bile duct and into the pancreas, liver and other accessory gastro-intestinal glands, into the intestines, appendix, colon, and rectum. Hence any infection of the mucous membrane of the nose can involve almost any organ in the body.

The nasal lymphatics lie just beneath the epithelium, forming a diffuse adenoid tissue, infiltrated with lymph-corpuscles, which, no doubt, helps to account for the marvelous destruction of bacteria by the nasal mucous membrane. The lymph is drained partly into the

retro-pharyngeal glands in the upper lateral pharyngeal wall in front of the axis, and partly into one or two glands which lie near the great cornu of the hyoid bone, and from all of these into the upper deep cervical glands. Obstruction to lymph drainage reduces the nasal immunizing power and leaves the body an easy prey to any air-borne infection.

Tuberculosis Prevented by Healthy Nose

It has been shown by St. Clair, Thomson and Howlett, that whereas the front of the nose contains numerous microorganisms, none are to be found in the posterior regions of 80% of normal noses; or, more strictly, none which are capable of growth upon the ordinary laboratory media. For practical purposes, at all events, one may say that inspired air which has passed through the nose is clean as well as moist, and that a healthy man possesses in that organ, a protective apparatus which relieves his lungs of all sources of danger, so far as the air inhaled through the nose is concerned.

Air-borne bacteria gain entrance to the body by way of the respiratory tracts. If the nose is normal there will be no tuberculosis. If the public press would start now and educate the masses as to the proper use of the nose, and if in all schools of learning, public and private, time were devoted to educating the rising generation to the point of using the nose properly and thus keep it in good condition, we would have no great white plague, nor any other infectious diseases. For years we have had it drilled into our heads by the medical profession of how important our lungs are and what to expect if tuberculosis enters them. How can the lungs develop if the breathing apparatus, nose, etc., is not working properly?

Catarrh, deafness, headache, bronchitis, gastritis, lack of development of body and mind, and a host of other abnormal conditions, are in the vast majority of cases primarily due to improper breathing.

Every attack of smallpox, typhoid fever, acute articular rheumatism, epidemic influenza (la grippe), erysipelas, measles, diphtheria, infantile paralysis, cerebrospinal meningitis, tonsillitis, bronchitis, pneumonia, hay fever, catarrh and other acute infections, begins with a cold in the head.

Tell your patients to bring their children in for treatment as soon as they have the first signs of a cold. Nearly all acute infectious diseases begin with "a cold in the head," and they never develop, if the "cold" is treated at once. Medical men will laugh at this statement. They cannot do anything for a cold. Yet hundreds of cases are on record of children that have entirely escaped children's diseases because

the defensive mechanism of the nose is normal and hundreds of cases of children's diseases are aborted every year when the nose is normalized and kept so. The first appearance of a watery discharge from the nose is the danger signal.

Suppurative Rhinitis a Serious Symptom

There is pus in the sinuses in the later stages of acute coryza; in chronic nasal catarrh; accompanying syphilitic, gonorrheal or tuberculous processes in the nose; during diphtheria, influenza, and the other specific exanthematous fevers; and in a number of rare conditions which it is well to look up in Ballenger and other authorities. This pus is discharged into the nasal passages and it is essential that both nasal cavities be thoroughly examined in a direct light by means of a speculum and head mirror to determine the source of the pus, specimens being taken for bacteriological examination when necessary.

The frontal sinus, maxillary sinus, and anterior ethmoidal cells open into the middle meatus through the infundibulum and semilunar hiatus and drain on to the upper surface of the inferior turbinate.

The posterior ethmoidal cells open into the superior meatus and drain onto the upper surface of the middle turbinate. The sphenoidal sinus opens into the upper, back corner of the olfactory fissure, between the septum and the superior turbinate.

There may, however, be a closed empyema in any cavity, and there is also great variation in the drainage, from normal free drainage to closed cavity. Closed pus cavities may demand operation. Diagnosis is by transillumination, or X-ray. There is danger of the infection spreading to the meninges and cranial cavity. The accessory sinuses are usually found to be involved in chronic rhinitis, and are always involved in suppurative rhinitis. The region beneath the Middle Turbinate is called the storm centre because the anterior group of nasal accessory sinuses drain into this region.

Wonderful Mechanism of Drainage in Normal Sinuses

When normal the nasal accessory sinuses are capable of self-drainage in the following ways:

1. The lining mucous membrane is composed of ciliated columnar epithelium, the motion wave of the cilia being always directed to the ostium, or opening into the nasal fossa, and the quantity of secretion being just enough to keep the mucous membrane moist.

2. They all drain toward the median plane, so that in lying with the head turned to one side, the sinuses in the upper side drain more

readily with aid of gravity and the sinuses on the lower side tend to drain more slowly.

3. Each sinus drains most readily when the position of the head is such that the lowest portion of the sinus is its ostium; namely:

(a) In the erect position, standing or sitting, both frontal sinuses.

(b) On lying down on the back, both maxillary sinuses.

(c) On lying face down, forehead lower than chin, both sphenoidal sinuses.

(d) The ethmoidal cells may drain directly into the nasal cavity, into the frontal sinus or into one another, and their drainage may therefore be simple as the frontal, or it may be very complicated.

The Edwards technique is today proving its efficacy in the hands of osteopathic physicians all over the country, in a remarkable variety of eye, ear, nose and throat conditions. Not only the profession but the public, owes Dr. Edwards a debt of gratitude for the wonderful work that he has done along this line.

The connection between a "cold in the head" and the acute exanthemata, has never been properly brought to the attention of the public. You should post yourself thoroughly on this point. It will save you many a patient who would otherwise, perhaps, shift to an allopath with the advent of acute disease. It will also establish you as an authority in the minds of your patients. It will save many a child from serious disease, impairment of faculties, distressing sequelae, and even untimely death. Your duty is plain.

A Normal Pharynx is to the Child What a Normal Nose is to the Adult

(a) Adenoid tissue is connective tissue like that forming the lymphatic glands. It consists of a network of fibres in the meshes of which lodge lymphoid cells. Bear in mind, that in early years, up to the age of puberty and in some cases beyond that age, the child depends in great part on the adenoid tissue of the pharynx to protect it against the exanthemata, and other infections.

(b) As the child approaches adult life the nose takes up the burden when the adenoid tissue in the pharynx atrophies. It is, therefore, of prime importance in children that the arterial blood supply, the venous drainage and the lymph drainage of the pharynx be thoroughly free and unobstructed. Any obstruction in the pharynx will obstruct the lymph drainage from the nose, will react on the vagus and other nerves and the superior cervical sympathetic ganglia and cause a variety of distressing symptoms in every organ of the body. On the other hand,

there is scarcely a disease of any consequence in which the pharynx is not involved. It may be inflamed by all pathogenic organisms, whether borne by air, food, water, blood or lymph, may show mucous patches, gummata, cancer, tubercle, abscesses; is involved in all the exanthemata, in nasal conditions, in nervous conditions, in heart disease, in kidney disease, in diabetes, in systemic toxemias, etc.

When children are threatened with any of the exanthemata there is always congestion in the regions draining the pharynx, due to the increased activity of the phagocytes destroying the invading bodies, coupled with muscular contractures and bony lesions in the cervical area, the hyoid, mandible, clavicles, etc. As long as the drainage is free, the child does not contract mumps, measles, scarlatina or any of the exanthematous fevers. It is only when obstruction has provided the invading virus with a suitable culture medium, free from pure blood, that disease can gain ascendency in the child's pharynx, nose, lungs, stomach, etc. Always examine every patient for obstruction to the drainage of the pharynx and free it up when necessary.

Drainage of the Pharynx, Nose and Ear

The retropharyngeal lymphatic glands on each side are placed in front of the atlas and axis, behind the upper back corner of the pharynx, upon the rectus capitis anticus major muscle. They receive lymph from the nasal fossae and accessory cavities, the nasopharynx and Eustachian tube and probably the middle ear. They drain into the internal group of upper deep cervical glands, which lie directly upon or close by the outer border of the internal jugular vein beneath the sternomastoid muscle forming a chain along the front, side and back of the internal jugular vein from the mastoid process of the temporal bone to the point where the omohyoid crosses the common carotid artery opposite the cricoid cartilage. The glands of the internal group communicate freely with each other and with the external group which lies behind and external to the internal jugular vein in the same region, draining the external regions of the side and back of the head. The internal group receives lymph from the retro-pharyngeal glands, mentioned above, and also from the parotid, subparotid, submental glands, the palatine tonsils and submaxillary glands, the superficial and deep anterior cervical and recurrent glands, and from the nasal fossae, nasopharynx, soft palate, roof of the mouth, tongue, larynx, thyroid gland, trachea and esophagus (cervical region); in a word, all the important structures on, within, or adjoining the mucous membrane of ear, nose, pharynx and cervical portions of the respiratory and digestive tracts. This shows

the extreme importance of free drainage. The internal group terminates in the jugular trunk, which on the right side, helps to form the right lymphatic duct or empties directly into the junction of the internal jugular and subclavian veins, and on the right side into the junction of the veins or into the thoracic duct.

Treatment to promote drainage consists in deep manipulation of the tissues beneath the mandible and the sternomastoid muscle. Nearly every patient requires this treatment. Glands may enlarge because of inflammation, injury, new growth, bacterial invasion, cancer, secondary syphilis, disease of any of the tissues drained or regurgitation, causing pressure on important nerves, arteries, veins, etc.

There are eight tonsils: The two faucial or palatine tonsils, to which the word tonsils is frequently limited, though strictly it should include also the lingual tonsils, at the base of the tongue, (described in Gray under tongue), the adenoid or pharyngeal tonsils on the upper part of the posterolateral walls behind the fossae of Rosenmuller and the tubal tonsils surrounding the Eustachian orifices.

Osteopathy for School Children

Ear, nose and throat affections would rarely occur if the colds and diseases of childhood and adolescence were properly looked after in the beginning. Osteopathy gets astounding results in these cases even when of long-standing. In nearly all cases when osteopathic treatment is given before great structural changes have taken place, the child is restored to a practically normal condition, is mentally and physically efficient, and is saved years of discomfort.

Children should not be sick. And they would not be sick if their noses, throats and mouths were kept normal, and due attention given to diet and hygiene. All infectious diseases are propagated via the nasal, oral and pharyngeal secretions. Therefore, (1) No child with "running nose" should be allowed to play with other children, because the nasal discharge may be charged with virulent disease; and (2) Any child with nasal discharge, hoarseness, or other symptoms of sore throat should receive expert attention at once. A child can readily be trained to do its breathing exercises, take the nasal douche and gargle the throat, by simply making sport of it as if it were a game. Care must be taken not to frighten the child.

Normal and Abnormal Adenoid Tissue

With the anatomy of the pharynx well in mind we will briefly review the function of the lymphoid tissue forming the tonsillar ring.

Formed by a special development of the mucous membrane, and characterized by an infolding of the epithelium into pockets or crypts, this tissue has engaged the attention of many investigators without definite determination of its exact function. However, we know that it is always there normally, and presumably it is there for a good purpose. Other vital organs whose function is not definitely known are the spleen, thyroid, thymus, pituitary and adrenal glands. These adenoid or tonsillar masses do not look like remnants of ancestral organs, such as the appendix, which is also rich in lymphoid tissue.

They probably have a function during childhood in some way similar to the thymus gland, which atrophies after a few years as do the tonsils. From their location and structure, I believe it is safe to assume that in infancy and childhood this tissue helps to warm, moisten and clean the inspired air, catching and holding the microorganisms inhaled. The nose and mouth are the only open portals through which disease germs may enter easily. Surrounding these open passages we find the adenoid or tonsillar tissue standing ready to receive these germs into its crypts, holding them there and not allowing them to penetrate any farther. The presence of a disease germ stimulates phagocytosis and other auto-protective reactions enabling the body to make an antidote for that disease. The tonsil may either secrete an antitoxin, or permit the necessary phagocytic action to render the microorganisms inactive. Or it may in some undetermined manner use the disease germs to elaborate serums or antibodies to protect the individual from the germs that surround it, particularly those to which children are susceptible.

Normal Tonsils Closely Related to Immunity

If this hypothesis should prove to be true or partly true; it would follow that the adenoid or tonsillar tissue is the natural protection of the body against the exanthematous fevers and other infections. Therefore, a child with a pharynx normal in structure and function would be immune to the common diseases of childhood. Hence the tonsils and adenoids, when doing no harm, should be let alone.

It is fair to assume that the adenoid or pharyngeal tonsil is a most important organ of defense against bacterial invasion. It produces phagocytes which attack and ingest the bacteria which gain entrance through the nose. Long-continued phagocytosis produces chronic hypertrophy of adenoid tissue in response to functional demand. To remove the adenoid while thus engaged in killing bacteria, is to lay the body open to bacterial invasion. When the blood and nerve supply

and drainage both venous and lymphatic, to nose, sinuses and pharynx are normal, the adenoid tonsil is not overtaxed and does not hypertrophy. The logical cure for adenoids is to correct the lesions and other conditions which permit too many bacteria to reach the adenoid. Merely taking out the adenoid tonsils, does not remove the cause of the hypertrophy. As a result of removal the body is laid open to invasion and in its struggle to protect itself goes right on building up adenoid tissue and in a very short while has it back where it was before operation. The adenoid tonsil is particularly connected with the prevention of cerebrospinal meningitis, When it fails in this task, the microorganisms overcome the phagocytes on the pharyngeal tonsil, and then pass along the blood vessels and lymph vessels and involve the sphenoidal sinus and sella turcica, thence spreading to the meninges.

Any interference with nasal space, such as deviated septum, polypi, hypertrophied turbinates, etc., affects nasal respiration, which in turn affects the nasopharynx and the respiratory tract. When nose-breathing is prevented or reduced by obstruction, the nose does not do its share of bactericidal work, overtaxing the pharyngeal tonsils. Furthermore, since the child now breathes through its mouth, the faucial tonsils also receive more bacteria than they should and they too enlarge in response to the functional demand. In a number of cases, I have noticed that after intranasal technique in adults to correct nasal obstructions there occurred a marked atrophy of the previously enlarged tonsils.

Normally, a large number of tonsillar masses are found imbedded in the mucous membrane of the side and back of the pharynx. They range from the size of a pinhead to a small pea. The true adenoid or pharyngeal tonsil is present at birth and increases in size with the growth of the child up to the seventh year. It remains at that size for a few years and then diminishes, is quite small at fifteen, and has almost disappeared by twenty.

Always remember this: THAT ADENOID TISSUE IN THE POSTERIOR PART OF THE PHARYNX IS NORMAL IN CHILDHOOD AND SHOULD NOT OBSTRUCT BREATHING NOR OTHERWISE DISTURB THE BODY.

When to Suspect "Adenoids"

"Adenoids" were discovered about thirty years ago in Denmark and the operation for their removal then began. When removed they grow again. The term "adenoids" or "adenoid vegetations" means in a child that the pharyngeal tonsil is larger than normal or has grown in such a way as to obstruct breathing. In an adult it means that the lymphoid tissue of the nasopharynx has not properly atrophied.

In most cases of adenoids, breathing is obstructed because the pharyngeal tonsil has grown so large that it takes up too much room in the nasopharynx and blocks the airway. In any case where a child does not breathe easily through the nose, suspect adenoids unless breathing becomes normal in a few days. In many cases the child can breathe through the nose when awake; but at night, when the soft palate is relaxed, the child breathes through the mouth. If the obstruction is greater, the child has to breathe through the mouth at all times.

The ventilation of the middle ear via the Eustachian tube may be interfered with by adenoids causing periodical or persistent deafness. Persistent snoring at nights in children is often due to adenoids.

Examination of nasopharynx may be made by palpation or by laryngoscopic mirror and nasopharyngoscope. In digital examination the index finger (with nail filed down to cushion) is passed above the soft palate, and the mass of adenoids on the roof, posterior and lateral walls of the nasopharynx are felt through the tip, sides and nail of the finger.

If the pharyngeal tonsil is normal, it is not to be disturbed. When its drainage is interfered with, it may become diseased; when it is overtaxed and its blood supply is increased it hypertrophies. When it hypertrophies, it reduces the airway through the nasopharynx, and it may become a serious obstruction.

All obstructions to the free passage of air through the nose and nasopharynx must be removed and the airway restored to normal freedom. Because of the obstruction to breathing, adenoids produce far-reaching bad effects on the body, the reduction of oxygen intake resulting in loss of energy, both physical and mental, with consequent retarded development. Locally, the obstruction results in mouth-breathing, arrested development of the nasal cavities, hypertrophy of tonsils, irri tation of the whole respiratory tract, because the air reaches it uncleaned, unwarmed, unmoistened.

The condition is due primarily to vasoconstrictor paralysis or vagus autonomic hyperactivity, resulting from osteopathic lesions, errors of diet, or other injurious habits or environment. Correction of lesions, nasal breathing, and normal diet and hygiene, potentially restore normality, and in cases seen before the breathway is much obstructed, may clear up the symptoms. Usually, the condition passes unnoticed by the parents till the breathway is seriously obstructed. The only thing to do at this stage of the condition is to have the adenoids removed if they obstruct the breathway. The operation is usually neither dangerous nor difficult. Up to the age of five, they can usually be removed in

one treatment. From five to eight or ten, they can be removed by five or six treatments. After ten years of age the growth of fibrous tissue makes them too hard to remove digitally and they should be cleaned out with a curette. The symptoms of adenoids and technique of the treatment are as follows:

Symptoms of Adenoids

1. Catch cold easily.
2. Recurring earache.
3. Nose bleed.
4. Enuresis, (wets bed at night)
5. Restless and nervous.
6. Tires easily.
7. Mouth breathing.
8. Poor appetite.
9. Constipation.
10. Chronic nasal discharge from both nostrils.

Examine pharynx digitally under anaesthesia to know if adenoids are obstructing the airway or interfering with the potency of the Eustachian tube. If so, remove as follows:

Operation for Removal of Adenoids

General anaesthesia.

Use index finger: take all aseptic precautions as indicated in post-nasal technique; file index finger-nail down to cushion. This is done by first making a knife-edge on nail as close as possible to cushion, moving the file away from you afterward filing off the sharpness level with cushion and being careful to file off all corners and sharp points so that nail cannot tear the delicate mucous membrane of the pharynx.

Insert finger in pharynx, entering at side of uvula. Then crush adenoids with back of fingernail and remove shreds as much as possible. A dull curette may be used for this purpose. Head should be held so that nasopharynx is lower than larynx, to prevent blood from entering larynx. If bleeding does not stop at once, it may be controlled by sufficient pressure upon the denuded surface. For this purpose, a long, curved hemostat holding a piece of picked gauze may be introduced and pressed against the bleeding surface. It may be removed in three or four minutes. Patient should rest for twenty-four hours, and be placed on a light, bland, unstimulating diet for two days, gradually returning to normal diet.

Adenoids are often a sequala of acute exanthemata. The irritation of the nasal and nasopharyngeal mucous membrane and the increased

numbers of bacteria cause overgrowth of the lymphoid tissue. Much of this irritation is allayed by osteopathic treatment of these conditions as indicated. I believe that adenoids will not occur following these diseases if proper osteopathic treatment is given as outlined. The human race could be emancipated from most diseases if the nose and nasopharynx could be kept normal. Moreover, I believe that children receiving regular osteopathic treatment will not easily contract any more "children's diseases."

Another serious element of danger from adenoids is that they invade the fossa of Rosenmuller and even extend to the tubal tonsil and block the Eustachian tube. In both these respects they interfere with the ventilation of the middle ear. Many cases of middle ear deafness have more or less adenoid overgrowth, which should be removed and normal blood supply and drainage re-established. The whole problem of adenoids, tonsils, etc. is well covered in Ballenger. Study it well there. But do so in the light of your own osteopathic viewpoint. The adenotome, curette, forceps, etc. are well-illustrated and explained.

Remember, that from the osteopathic viewpoint, the adenoids are overgrown glands, mostly lymphatic. When normal they have an important function to perform. When abnormal they are probably unable to perform their function normally. The whole trouble may clear up when you normalize the nasal ventilation, the venous and lymphatic drainage and correct the lesions found, cervical and upper dorsal; if it does not clear up within a few weeks, the indications are to remove the adenoids and keep up the treatment to restore the nasopharynx to normal. Simply removing adenoids without osteopathic treatment as indicated, is useless, for the tissue grows right back again, as long as the ventilation, blood supply and drainage remain abnormal.

The Lingual Tonsils

The lingual tonsils, situated together, at the base of the tongue, cause many coughs. Manipulation of lingual tonsil, with index and middle finger at the base of the tongue gives relief and is diagnostic. If permanent relief is not afforded by deep local manipulation and drainage of lymphatics and restoration of the blood and nerve supply by correcting lesions found, then lingual tonsil should be removed surgically. The lingual tonsil sometimes overlaps and blends with the faucial tonsil. The lingual tonsil atrophies at fourteen years of age, after which the base of the tongue becomes carpeted over with adenoid follicles.

The Faucial Tonsils

The faucial tonsils are situated on both sides of throat in the pocket between the anterior and posterior pillars of the fauces.

One thing, bear in mind: a tonsil which sticks out into the throat may look large and still be no larger than is normal for a person of that age and it is no more likely to do harm than is one out of sight. Size has no great importance. Are they healthy or not, is the important factor. How many physicians who examine our school children daily in our public schools know this? Tonsils that are unhealthy often show repeated attacks of tonsillitis.

Quinsy is a peritonsillar abscess or a collection of pus in the region just behind the capsule of the tonsil.

The removal of tonsils has been done more or less for a century. The operation appears to become popular at times and then go out of fashion. It is now more frequent than ever before.

The lymphatics draining the tonsil empty into the deep cervical chain beneath the sternomastoid muscle. The lymph nodes that receive the tonsillar efferent lymphatics are situated near the tip of the great cornu of the hyoid bone overlapping the jugular vein. They are almost invariably enlarged in tonsillar affections, and this enlarged mass is often mistaken for the tonsil. The tonsil, however, corresponds to the angle of the jaw. The swelling of these glands in scarlet fever has led some investigators to believe that scarlet fever finds its way into the system through the faucial tonsils. These glands are also frequently the first to enlarge in tuberculous disease of the cervical glands, hence the tonsils may be the primary source of infection for tuberculosis. The tonsils are usually inflamed at the onset of rheumatic fever. Many other conditions also point to the faucial tonsil as the site of entry of virulent disease; and as a strong protection against disease when normal.

The tonsillar crypts or fossulae, formerly called follicles, are tubular recesses or pockets in the tonsil (the faucial tonsil has about 20), lined with stratified pavement epithelium. They are surrounded by follicular tissue and extend right through the follicular tissue to the capsule. They may become filled with food, dead epithelium, bacteria, leucocytes and mucus, causing local congestion and (perhaps) constitutional disturbance. When for any reason the crypts are clogged, or the nerve and blood supply to the tonsil, or the venous or lymphatic drainage from it, are interfered with, the tonsil may become the seat of inflammation. The tonsil has been held responsible for rheumatism, endocarditis, insanity, and what not. Streptococci lodged in the tonsil are supposed

to be the active agent. The toxins reach the blood-stream directly or by way of the lymphatics. The toxins are supposed to cause insanity by reaching the brain via the sheath of the third division of the fifth cranial nerve which is in relation to the tonsil. While the tonsil is not universally accepted as the cause of these conditions, it is well to bear this possibility in mind and consider the tonsil whenever such a case presents itself. The crypts may also harbor acute infections, which may therefore be transmitted to other people.

The decomposition of retained epithelial structures within these crypts produces the fetid breath found in some cases of enlarged tonsil, and probably plays a part in reducing the vitality of the tonsil and causing tonsillitis. When calculi form in the crypts they irritate twigs of the glossopharyngeal nerve and cause a spasmodic cough.

While Metchnikoff has shown that mucus taken from the surface of the tonsil, is rich in leucocytes and phagocytes filled with microorganisms, still the tonsil differs from lymphatic glands in its construction and in the possession of the fossulae or crypts. There are no lymphatic sinuses around the tonsil. When normal, the tonsils do not absorb liquid or solid particles from the oral cavity. The lateral, or external deep surface of the faucial tonsil is encased in a firmly adherent, strong, fibrous capsule, into which are inserted muscular fibres derived from the superior constrictor of the pharynx. The sheath is not perforated by lymphatics, nerves, arteries or veins. It is firm and solid and prevents abscesses of the tonsil from opening into the maxillopharyngeal space. The sheath sometimes sends a network of fibrous tissue into and between the folds of the mucous membrane and along the blood vessels of the tonsil which prevents the blood vessels from readily contracting when cut. The severe hemorrhage thus produced is often wrongly attributed to hemophilia. Hemophiliacs may be detected before operation by letting a few drops of blood and testing for clotting by passing needle through them. The tonsil is only slightly vascular. Its nerve supply is not clearly established. The production of lymphocytes within the follicles has been observed. These lymphocytes pass through the mucous membrane into the crypts and thence to the mouth where they are thought to be identical with the corpuscles of the saliva.

It is difficult to define a normal tonsil. The size, shape, consistency, color, weight and general appearance vary in different individuals, and from time to time in the same individual. These characteristics undergo constant change from infancy to old age. The faucial tonsils are largest from three to eighteen years, after which they diminish in size, have a smooth surface and a firm, cartilaginous consistency. Although

often large enough to annoy during childhood, they generally cease to annoy after puberty. With advancing years the tonsil atrophies, gets harder and smaller and infections become less.

The Tonsil Has a Wide Range of Motion and is not Firmly Bound Down to the Sinus Tonsillaris

The tonsil is loosely adherent to the sinus tonsillaris which is a pyramidal space bounded by the anterior faucial pillar, the posterior faucial pillar, and the superior constrictor of the pharynx. The tonsil is moved inward by the superior constrictor muscle in swallowing, and outward by the stylopharyngeus. The anterior pillar may be well-developed or poorly-developed. The tonsil thus presents very different appearances within a few seconds, and the extent to which it projects beyond the level of the pillars gives no true idea of its size. Above the tonsil, is the tonsillar recess, where the pillars meet the soft palate, and joining the pillars above is the plica supratonsillaris. Below, the plica tonsillaris passes from the anterior pillar to end on the antero-inferior aspect of tonsil. The plica is composed of a fold of the mucous membrane.

The plica protects the tonsil during deglutition and prevents food from entering the crypts. Under certain conditions the plica becomes atonic, allowing food to enter the crypts and set up inflammation. If the plica then becomes adherent to the mucous membrane of the tonsil so that the crypts cannot empty, the crypts become packed with (1) the retained food particles; (2) desquamated epithelial cells from the lining mucous membrane; (3) the leucocytes that are continually being produced; (4) the mucous secretion of the lining mucous membrane of the crypt; and (5) bacteria. In some cases there is no inflammation, but in many cases the clogging of the crypts leads to inflammation, reduced vitality and disease of the tonsil. To relieve this obstruction some operators are advocating a resection of the plica triangularis, but we osteopaths contend that it is normal to every throat and has an important protective function and should be freed but not removed.

Tonsils, clinically, may be divided into FREE and SUBMERGED, and may be large or small, fibrous, hypertrophied, atrophied, infected, etc.

Free tonsils have very little plica, and when large, extend prominently beyond the faucial pillars. The surface is studded with crypts. Submerged tonsils have a well-developed plica and may be either small or large. Even when large they do not have a cryptic appearance over the entire pharyngeal aspect.

Tonsillectomy May be Avoided by Freeing the Plica and Draining the Crypts

In some cases the plica may be freed from the tonsil by simply separating it with the index finger. This technique saves the tonsils and avoids tonsillectomy in 90% of the cases among children and 75% of adult cases. Dr. James D. Edwards of St. Louis, in May, 1915, in an article in the A. O. A. Journal on "Conservative Surgery of the Tonsil" advocated circumcision of the tonsil, by separating the pillars and loosening up the plica with the index finger. This was followed by Dr. Murphy, an allopath of Mason City, Iowa, who advocated the same technique several months later, using blunt scissors to dissect the adhesions between the pillars and tonsils. Osteopathy claims priority for this technique. Dr. Edwards uses general anaesthesia and does the work in one treatment. General anaesthesia is essential in children, but in adults it may also be done under local anaesthesia, the tonsils and pillars being desensitized with PROCAIN.

When the plica is not adherent to the mucous membrane of the tonsil, or after it is freed as above, the retained material may be withdrawn either by suction, or by pressure from behind. Dr. T. J. Ruddy of Los Angeles, uses a "Ruddy Tonsil Suction Cup" producing suction by means of a "Bulb." This aspirates the retained material from the crypts. It is excellent technique to diagnose diseased tonsils, as the pus can be collected with ease for microscopic examination. This instrument can be purchased from Sharp and Smith, Chicago.

Dr. Edwards uses an instrument called "Edwards Tonsil Searcher" to explore the plica, crypts and tonsillar recess and to press the material from the crypts. It is a blunt probe bent at a right angle and with it the anterior pillar of the fauces is pressed backward and outward, causing the tonsil to come forward into the throat. This technique everts the tonsil and exposes the crypts and hidden pockets. The gagging of the patient then squeezes or milks the tonsil so that the crypts are emptied from behind. The extruded material escapes into the throat and is expectorated.

The tonsil may then be sprayed with normal saline solution, and if it is suspected that the crypts still retain material, a bent trocar may be introduced into the crypts and the saline solution forced directly into them by a syringe. In some cases, it is advisable to swab out the crypts with a cotton wound applicator dipped in iodine. This is advisable before operation to help make the field of operation aseptic, and prevent possible infection that may arise from an otherwise unsuspected tonsil.

Ballenger points out that the pricky sensation in the throat accompanied by slight soreness that persists for several days is due in some cases to infection in the tonsil, and when present is an indication to use caution, and to make sure that the crypts are rendered aseptic before operation.

Relation of Tonsils to Deafness

The tonsil cannot press the Eustachian tube, but it may disturb the soft palate and the tensor palati muscle which helps keep the tube patent. The deafness in these cases is however, more likely due to adenoids or to hypertrophy of the adenoid tissue within the mucous membrane of the Eustachian tube itself, or to extension of inflammation from the inflamed tonsil. Many cases of deafness in which the tonsils have been removed, have not cleared up for a considerable time, indicating that usually the tube is not blocked by any mechanical interference, but is occluded or rendered less patulous by the same hypertrophic process which affected the tonsil. The deafness was not due to pressure but to extension of the inflammatory process. Moreover, that inflammatory process is due to osteopathic lesions interfering with blood and nerve supply and venous and lymphatic drainage; and when these are corrected, the tonsil and Eustachian tube soon return to normal; more quickly in fact than they do by removing the tonsil. And when once returned to normal they do not easily become diseased again; and the answer to the argument that they are no use in and might just as well be out, is that in about 50% of the cases in which they are removed, one or other of the important palatal muscles is no longer able to work properly. When the tensor palati is affected, the Eustachian tube tends to become more occluded resulting in increased deafness.

Every Inflamed Tonsil Should be Accurately Diagnosed and Adequately Treated

Follicular Tonsillitis (or acute fossulitis, as it is now called) may be distinguished from diphtheria by laboratory diagnosis and by inspection. The Klebs-Loffler bacillus identifies diphtheria. It is not found in follicular tonsillitis. In diphtheria the membrane is a dirty white color, continuous, sharply defined, and leaves a raw surface when torn off; in follicular tonsillitis it is yellow, patchy, tears off without laceration, not continuous and has irregular sloping edges, and an exudate on surface of tonsil. Scarlet fever is more violent in onset and the eruption comes out in 24 hours. These three diseases must always be differentiated in any sore throat, and all precautions taken. They occur most frequently in children, are quite acute, sudden in onset, and have temperature.

Follicular tonsillitis is accompanied by enlargement of the tonsils making swallowing difficult. Temperature may reach 103 or 104. Anorexia, vomiting, constipation, pain in ear, thorough extension along Eustachian tube, and much inflamed throat. Treatment: Rest in bed, if severe; fever diet, water and fruit juices for three days, then milk. General spinal treatment to promote elimination. Correct lesions in upper cervical, upper dorsal and ribs, etc. Muscles over 1st and 2nd ribs are very sore. Digastric is contracted. Relax it. Spring jaw. Release supra and infrahyoid muscles. In younger children clean out mouth with solution one-third liquor antisepticus U. S. P., or listerine in water.

Coldpacks around throat are beneficial unless tonsil contains pus. In suppurative conditions apply heat. Thoroughly drain the lymphatics, especially around angle of jaw, as described in Lecture Thirteen. Sweep the tonsil with the index finger and manipulate it between the index finger that is touching it within the mouth and the other index finger that is outside by the angle of the jaw. Stretch the soft palate and do any corrective work needed in the nasopharynx, clean out fossae of Rosenmuller, etc. Treat twice or three times daily during acute exacerbations. During chronic inflammatory periods treat daily till drainage is established, then three times a week. Recurrent tonsillitis can usually be controlled in one day by one general treatment to free up elimination followed by enema, etc., and then two other internal throat treatments. Order gargle of Lugol's solution, 10 drops to half a glass of water every two hours. Lugol's solution is a "Compound Solution of Iodine." It is an aqueous solution of 5% of iodine and 10% of potassium iodide, and should be in the office of every physician who is doing nose and throat work. Irrigate the throat with about two quarts of normal saline at a temperature of about 110, twice or three times daily, and irrigate the nose with same quantity of normal saline, morning and evening. Give osteopathy a fair trial and the case will nearly always clear up.

After attack subsides, with history of recurrent attacks, consider tonsillectomy. After tonsillectomy, post-operative osteopathic treatment should be kept up for a long enough period to restore the pharynx to normal condition, otherwise the same trouble will recur, despite the absence of the tonsils. The condition is due to vasomotor paralysis and vagus hyperirritability. Therefore, osteopathic treatment is absolutely essential to restore vascular tone, and dietary and other habits must be corrected to remove irritation of vagus and sacral autonomics. Reason out treatment for each case along lines laid down in Hay Fever

and Asthma. Each case is different, but the underlying principles apply to all cases in some degree.

In acute tonsillitis, Edwards swabs tonsil with 90% of silver nitrate, being careful to touch the swab to a piece of gauze before applying to the tonsil (to avoid dripping). This is allowed to remain three minutes (it blanches the tonsil) and is followed by swabbing the tonsil with saturated solution of sodium chloride, (table salt, chemically pure). This neutralizes the caustic action of the silver nitrate. Usually two applications together with osteopathic treatment to correct lesions and normalize the nose and throat, will cure a severe case of acute tonsillitis.

Chronic tonsillitis is a chronic inflammation of the tonsils and other lymphoid tissue of the throat. It follows repeated attacks of acute tonsillitis. It is also a sequela of many of the infectious diseases. The tonsils are permanently enlarged, but may be either free or submerged; are rough and pitted. There is some difficulty in swallowing and breathing. The child becomes a mouth-breather, dull and backward, does not develop as he should, and sometimes shows Rickety-rosary and Harrison's groove. Absorbed toxins produce headache, etc. The cause of the trouble is often overlooked and you have a chance to make a spectacular cure because many of these cases clear up after removal of the adenoids, followed by correction of cervical and upper dorsal lesions and thorough osteopathic treatment till restored to normal. If case is seen after tonsil is fibrous, have it out. The condition will recur if osteopathic treatment is not given.

When to Advise Operation

If adenoids are really obstructing nasal breathing, it is best to remove them, because their removal does very little damage compared to the serious effects of mouth-breathing. But if the symptoms are trivial, the adenoids and tonsils should not be taken out merely because they look large. Neither should tonsils be taken out at the same time as the adenoids are, just to have it over in one operation. Before advising removal of tonsils, one should be absolutely certain that the disease that affects the tonsil cannot be cleared up by osteopathy or some other rational treatment.

The abnormal condition of the tonsil may be primary, secondary, systemic, reflex, mechanical or hyperplastic. If primary, it starts in the mouth and affects chiefly the crypts (fossulae). Use Edwards' method to free up the plica and pillars of the fauces. Open the crypts to establish free drainage from the crypts. Correct the lesions that affect the blood and nerve supply and drainage. And squeeze or manipu-

late the tonsil between a finger in the fauces and a finger beneath the ramus of the jaw.

Secondary affection is via the lymph channels, chiefly from the nose. When the nose and sinuses are restored to normal and kept clean the tonsil condition will clear up without operation.

Systemic affection of the tonsil via the blood is quite common, and the tonsil is not to be removed simply because attacked. Rather, the channels of elimination should be stimulated and the formation of antibodies in the spleen increased, so that the general bodily condition can be thrown off.

Reflex affection of the tonsil may come from dental caries, gingivitis, pyorrhea, or other irritants to the fifth cranial nerve, as well as from spinal lesions and rib lesions from the fourth dorsal up to the occiput. Hyoid and thyroid lesions may affect the drainage via the deep cervical lymphatics, and contractions of the cervical muscles may also interfere.

The tonsil may be enlarged in response to mechanical stimuli from the faucial pillars and the constrictors of the pharynx and stylo-pharyngeus, also from misuse of the voice. Very tight biting contracts the pterygoids and forces the tonsils toward the median line of the fauces against the bolus of food, permitting food to enter the crypts with greater force than the delicate structure can stand. These cases should be given the throat exercises as in Lecture Sixteen and should receive voice training in singing and elocution.

When tonsils are hypertrophied or hyperplastic or diseased, the trouble is nearly always the effect of some derangement of function of some other part of the body. If this is found and corrected, the tonsils will become healthy again. Do not operate unless the tonsils are a menace to health. In cases where you have definitely determined the nature of the disease of the tonsil (placed it in its proper group) and given it consistent osteopathic treatment without results, it is best to remove the tonsils. But if the symptoms are trivial, the size of the tonsils is not an indication for removal. If the nose were kept clean, few operations on the tonsils would be necessary. By keeping the nose and mouth clean, and giving thorough osteopathic treatment to normalize all the structures related to the tonsil, we can save nearly all tonsils. Faulkner, in his book "The Tonsils and the Voice," 1913, states that Frederic Young found all prima donnas with extraordinary voices had big tonsils. Also, that among 8,000 pupils examined by Neustaedter, tonsils were largest in the best pupils, and the best singers had fifty per cent more tonsils than the poorest. Finally, competent authorities quoted by Faulkner differ as to the advisability, or even the possibility, of com-

pletely enucleating or removing the tonsil, and some of them even claim that the benefit of the operation is in proportion to the amount of tonsillar tissue which remains after the operation. These views do not seem to agree with current practice. In view of all the anatomical, physiological and pathological facts and probabilities, I think it is best to treat all tonsil cases without operation until we have proof that the tonsil in a given case is an actual menace to the health of the individual. There are enough tonsils that have to come out without taking out tonsils that can be saved.

Improving the Drainage From the Tonsil

The upper part of the tonsil is in front of the transverse process of the atlas. The lateral side of the tonsil is in relation with the superior constrictor muscle, and is internal to the angle of the mandible. It enlarges in the line of least resistance toward the median line of the pharynx, with but little effect in its relations laterally. It can be palpated in the normal neck by placing the index finger as close to the front of the transverse process of the atlas and to the internal surface of the mandible as possible. Steady drawing forward of the mandible with the index finger and of the tissues in relation to it with the middle finger is effective in draining the tonsil. The lymphatic glands near the tip of the greater cornu of the hyoid receive the lymph from the tonsils and are nearly always enlarged if the tonsil is affected. This mass is often mistaken for the tonsils. The glands that receive the drainage from the tongue also tend to enlarge in any ear, nose or throat condition. This congestion irritates the vagus and causes decreased heart action and general systemic depression. This depression is a frequent symptom in ear, nose and throat conditions. I get astonishing relief from the congestion and the consequent depression by the following technique. Note that this technique is given after I have first freed up the kidney, bowel and skin elimination by such treatment as is indicated in the particular case; second, established normal activity of spleen, pancreas, liver, stomach and intestines by appropriate treatment; third, thoroughly relaxed the upper dorsal and cervical musculature and adjusted the vertebrae so as to insure normal secretory and vasomotor impulses to the lymphatics, veins and arteries from the neck up; and fourth, drained the lymphatics beneath the sternomastoid. I then take a clean towel and with patient on back have patient open mouth wide and protrude tongue, I grasp the tip of the tongue in the towel and gently but firmly squeeze the entire tip of the tongue for about an inch between the thumb and index finger of both hands. This

presses the lymph against the lymph nodes and irritates them to activity. Then draw the tongue forward, downward and lateralward to stretch the tissues. With cotton rolls between lips and teeth to avoid cutting the lips on teeth, I now place one index finger in the mouth between the mandible and the index finger of the other hand on the outside between the mandible, and gently manipulate the tissues between the fingers, draining them toward the median line. Then with the index finger beneath the tongue press the tongue toward the opposite side of the mouth, and with the outer finger reverse the motion. These movements thoroughly stretch and drain the tissues of the tongue and tonsil. Do the drainage from the outside only, two or three times before you do any inside work to improve drainage.

Osteopathic treatment saves practically all tonsils except those that are seriously diseased. Some osteopathic physicians are inclined to claim that tonsillectomy is never justified, because so many brilliant results follow osteopathic treatment. But I have seen a number of cases of large fibrous tonsils and seriously diseased tonsils, the removal of which was decidedly beneficial to the patient. Choose the least evil in such cases. It is bad to remove tonsils, but in cases where it is worse to leave them in, have them out. In children they are rarely diseased, and normally they atrophy at puberty. The operation is, therefore, in most cases, not indicated at once. There is no hurry about operating and there is nearly always time enough to clear up the condition osteopathically, because these structures respond promptly. But if the recurrent tonsillitis does not clear up under osteopathic treatment, it is best to remove the tonsils. In some cases they are enlarged enough to interfere with the foodway, making swallowing difficult; or they may interfere with the tensor palati and indirectly interfere with normal ventilation of the middle ear through the Eustachian tube. Such tonsils obviously are better out.

The normal tonsil, especially during the first twenty years of life, is a useful part of the autoprotective mechanism of the body. If in a given case it is found to be diseased, and is suspected of causing symptoms of infection in other parts of the body, such as tuberculosis of the cervical glands, osteomyelitis, acute articular rheumatism, endocarditis, nephritis, orchitis, adenitis, laryngitis, etc., and if it fails to respond to persistent osteopathic treatment over a period of several months; the question to be decided is then whether the tonsil has become so diseased that it is really a portal of infection rather than a barrier and defense. Since in these cases the tonsil is not performing its function of protection, and is in effect a menace to the body, it should be completely re-

moved, including the capsule. If any part of the tonsil is left, it will regenerate. When removed, the tonsil presents the appearance of a definite mass of lymphoid tissue enveloped in a smooth, glistening capsule on its outer, lateral, aspect, and mucous membrane on its inner, median, aspect. If care is taken to avoid injuring the muscles in relation to the tonsil, there is very little hemorrhage in tonsillectomy. The location of the ascending pharyngeal artery, of the pharyngeal venous plexus, and of the main arteries whose small branches supply the tonsil should be distinctly borne in mind. The severe bleeding that occurs in some tonsillectomies is due to rupture of one or more of these vessels. I have seen many surgeons remove tonsils. Some of them were men of national reputation. But never in my life have I seen such rapid and efficient tonsillectomies as those performed by Dr. Edwards at the 1920 Convention of the A. O. A. at Chicago. In case after case he removed diseased tonsils from adults in the phenomenal time of four seconds for each tonsil. The operation was practically bloodless and painless. He anaesthetizes the tonsil by swabbing the parts with 10% cocaine in adrenalin chloride 1-1000, (48 grains of cocaine to 1 ounce of adrenalin chloride). Swab every three minutes for ten minutes. He used the new Sluder-Edwards technique, which is Edwards' Finger Surgery plus Sluder guillotine, the tonsil being digitally dissected from the muscular walls of the sinus tonsillaris and removed completely with the capsule intact, without damaging the muscles of the faucial pillars or of the pharynx, and without cutting any bloodvessels except the relatively small vessels which supply the tonsil itself. Edwards-Sluder technique is a decided improvement over the operations described in Ballenger. Dr. Edwards has not made public this technique, but has given me the privilege of telling you about it in advance of publication.

Tonsillar and Peritonsillar Abscess

Peritonsillitis or quinsy is an inflammation of the tissue around the tonsil that rapidly becomes an acute abscess, calling for immediate draining to avoid serious complications such as edema of the larynx, strangulation, or ulceration of the great blood vessels in the neck. Fortunately, it is rare in children, being most often found in young adults.

Tonsillar abscess or phlegmonous tonsillitis is more rare than quinsy, the upper lobe of the tonsil being most usually affected. In many of these cases, if free drainage is restored to the upper lobe the condition may be aborted. Thoroughly free the drainage by sweeping out the supratonsillar fossa with the index finger. (Nail filed down to cushion). Free the plica and clean out the crypts. If this does not stop the pro

gress of the inflammation, slit up the upper part of the tonsil, or lance the tonsil where the abscess points if this spot can be found.

In quinsy find the point of fluctuation or pointing and let it out. The essential thing to remember is that the pus is between the tonsil and the faucial pillars and pharyngeal constrictor, but not in the tonsil. In lancing to let out the pus, it is necessary to make sure that the peritonsillar space is drained; if this precaution is not taken the incision may be made into the tonsil without allowing the pus to drain. Occasionally the pus can best be drained by making an incision right through the tonsil to the capsule.

Fluctuation is usually felt in the upper third of the anterior pillar. The finger feels a pumping or pulsating sensation. When the pus is within the tonsil, the tonsil is swollen (as compared with its fellow of the opposite side) and extends out toward the median line. When the pus is behind the capsule of the tonsil, the tonsil is pushed upward and may bulge the anterior pillar. It has a certain consistency and resistance to the touch, whereas the place to lance is where the fluctuation is felt. Use local anaesthesia. Make the incision through the anterior pillar, far enough anteriorly to avoid incising the tonsil. The incision should reach behind the capsule of the tonsil. To lance, wrap adhesive tape around lance half an inch from the point and then make an incision at the place where the abscess points if this spot can be found. Then insert hemostat and by spreading it enlarge the incision. This releases the pus in nearly all cases. If the pus is not found, it may be pointing posteriorly into the pharynx and may discharge into the larynx causing death. It may be necessary to do Ballenger's operation which consists in dissecting the capsule away from the superior constrictor muscle. It is also sometimes necessary to lance the posterior pillar.

Treatment of Pyorrhea

Dental caries may be evident on inspection of the teeth, or may be hidden by the adjoining tooth. Pus cavities may be located on the roots of teeth. Pyorrhea alveolaris, also called suppurative gingivitis or Rigg's disease, is characterized by a purulent discharge from between the teeth and the gums.

There is a septic infection of the sockets, the teeth loosen, and the gums are eroded and recede. These symptoms are accompanied by bleeding gums, foul breath, dyspepsia, anaemia, ill health, apathy, nervous disturbances, and sometimes general pyemia, synovitis, and arthritis, neurasthenia and depression. Treatment consists in keeping the mouth clean, and freeing up the upper dorsal and cervical area so that

a normal blood and nerve supply can reach the sockets of the teeth. Also free up the drainage and general elimination, and stimulate the spleen to the formation of antibodies. X-ray the teeth and have pus-pockets cleaned out.

Then, locally, press the gums between the thumb and forefinger and hold for a few seconds, repeating till the entire upper and lower gums have been treated. Repeat the manipulation of the cervical deep lymphatics. Repeat morning and evening, until tenderness is gone and blood supply and drainage is normal. Try this technique on yourself and see whether your gums are normal.

These patients should have three tooth-brushes and use a different one after each meal; allowing it to dry 24 hours before using again, otherwise they reinfect their gums with bacteria remaining on the damp brush. A dry brush has very few bacteria on it.

Edwards described the following technique which is very effective in the various forms of laryngitis, also in asthma and clergymen's sore throat and voice affections. It is essentially a SUSPENSION manipulation. This is done by passing index and middle finger of right hand into the mouth, on the dorsum of the tongue to the larynx. The index and middle finger then pick up the right and left cornua of the hyoid, rocking and rotating it, while the left hand is opposing on the outside of the throat, moving the thyroid cartilage in the opposite direction. This drains the saccule and ventricle, releasing the passive congestion and the muscular and ligamentous contraction.

Edema of the Larynx

In this form the inflammation is accompanied by exudation and infiltration of the tissues, as distinguished from the distinctly catarrhal laryngitis, or the spasmodic nervous laryngismus stridulus. Most usually due to obstruction to the internal jugular veins. Also due to errors in diet, such as too much salt, or too large a proportion of irritating substances, that overstimulate the kidneys, and irritate the vagus generally throughout the digestive apparatus and elsewhere. The specific lesion must be corrected, and the diet and other habits regulated. Thorough elimination must be secured through bowels, kidneys, skin and lungs, by osteopathic treatment, enemata, hot bath and fresh air. In treating thoroughly relax the tissues of the neck and throat, raise the clavicle, and relax the deep anterior muscles and tissues of the root of the neck. Drain the lymphatics. Opening the mouth against resistance aids the circulation of the carotids. Treat the vagus along the course of the sternomastoid and at the superior cervical region. Treat the

superior laryngeal nerve behind the superior cornua of the thyroid cartilage. Treat the recurrent laryngeal nerve at the inner side of the sternomastoid at the level of the cricoid cartilage. Treat deeply along the sides of the larynx and trachea, applying the fingers close along the sides of the trachea. This relieves the huskiness and spasm, though the spasm often depends on the approximation of the hyoid to the thyroid or on some specific osteopathic lesion.

Dropsy from kidney, heart or lung disease must be treated by removing the cause of the primary disease, if possible. In dangerous cases of edematous laryngitis, great care must be taken. Intubation or tracheotomy may become necessary to prevent suffocation, but ordinarily an operation can be obviated if the case is seen in time. Hot footbaths, hot drinks, milk or seltzer-water may give relief. The condition and operations are well described in Ballenger. It is well to read up all there is about laryngitis in all the text-books you have and have your treatment definitely in mind, because when you are called into any of these cases it is usually necessary to act AT ONCE.

The lymphatics of the outer ear accompany the veins and empty into the posterior auricular and parotid lymph glands. These in turn drain into the superior deep cervical chain.

Any obstruction to venous or lymphatic drainage will cause a passive congestion of the meatus with hypersecretion of cerumen.

The LYMPHATIC DRAINAGE of the membrana tympani is into the parotid and posterior auricular lymph glands superficially, and into the retropharyngeal lymph glands via the lymphatics along the Eustachian tube. In myringitis or any other diseased condition of the membrana tympani, free up the lymphatic drainage of the superior and inferior deep cervical chain, then the parotid and posterior lymph glands, and then go behind the soft palate, clean out the fossa of Rosenmuller and drain the retropharyngeal glands by two or three strokes of the index finger in the upper back corner of the pharynx on the affected side. If this is done early enough, and the lesions corrected and other sources of irritation cleared up, the condition will improve with surprising rapidity.

Mucous Membrane of the Tympanum or Middle Ear

The mucous membrane of the middle ear is continuous with that of the pharynx, through the Eustachian tube. It invests the ossicles, muscles and nerves contained in the tympanic cavity; forms the inner or medial layer of the membrana tympani, and the lateral or outer layer of the secondary tympanic membrane that closes the round window. It is reflected into the tympanic antrum and mastoid cells which it lines

throughout. It also forms several vascular folds which give the interior of the tympanic cavity a honeycombed appearance. In the tympanic cavity this mucous membrane is pale, thin, slightly vascular, and covered for the most part with columnar ciliated epithelium, but over the pyramidal eminence, ossicles and membrana tympani, it possesses a flattened, non-ciliated epithelium. In the tympanic antrum and mastoid cells the epithelium is also non-ciliated.

In the Eustachian tube the epithelium of the mucous membrane is columnar and ciliated. In the osseous portion of the tube the mucous membrane is thin, but in the cartilaginous portion it is very thick, highly vascular and provided with numerous mucous glands. These anatomical factors are important to remember in the treatment of tubal catarrh, tubal occlusion and middle ear conditions.

LYMPHATIC DRAINAGE. The majority of the lymphatics of the ear follow along the Eustachian tube and empty into the retropharyngeal glands. They are drained by sweeping out the fossa of Rosenmuller. Others reach the postauricular glands over the mastoid process, where they can be drained directly. Both empty eventually into the Superior Deep Cervical Glands which must be thoroughly drained in any middle ear condition.

LYMPHATIC DRAINAGE OF INNER EAR. I have not found any lymphatic drainage described from the inner ear to the cervical lymphatic glands, but it is likely that some lymphatic drainage passes from the inner ear by way of lymph vessels accompanying the stylomastoid vein. The perilymph is in communication with the subarachnoid space and, no doubt, drainage is dependent upon the difference in pressure between the fluid in the subarachnoid space, and the fluid in the labyrinth.

Our problem of relieving ear symptoms due to nerve involvement resolves itself into one of establishing free drainage from the cranial cavity. This is best facilitated by thorough osteopathic treatment, with special attention to upper cervical and mandibular lesions, restoring free motion to all vertebrae and dilating abdominal vessels. The internal jugular vein must be relieved of back pressure, and no obstruction permitted to retard the escape of cerebrospinal fluid into the lymph spaces of the cranial and spinal nerve sheaths. Also, all the emissary veins and the anastomosing veins must be carefully treated, such as the anastomoses of the ophthalmic with the facial, in order that the freest possible escape may be afforded for the blood and cerebrospinal fluid from the cranial cavity. Note particularly the vein connecting the lateral sinus with the posterior auricular or with an occipital vein. Blisters or leeches have been applied here to facilitate cerebral drainage.

Note also the connection between the cranial veins and the lateral sinus via the diploic veins. Note also that the veins within the cavities of the nose and middle ear communicate with those of the meninges.

Acute Otitis Media

Acute otitis media is divided clinically into Acute Catarrhal or Non-Suppurative Otitis Media, and Acute Suppurative Otitis Media. Inflammation of the middle ear usually begins by extension from the nasopharynx via the Eustachian tube, but it may occur directly from the blood stream. The exudate is simply excessive mucus or it may be purulent. The membrana tympani has a tendency to rupture at the point of greatest bulging, and should be incised before rupture occurs. The simple catarrhal secretion rarely ruptures the membrana tympani. All cases begin with chills, fever, vomiting and prostration. Most cases terminate in resolution, but some go on to the purulent stage. Thorough osteopathic drainage of the Eustachian tube, and the lymphatics, together with correction of mandibular, occipital, cervical, and dorsal lesions, usually control the case if seen early. Opening the mouth against resistance should be done by the patients at intervals. Scarlet fever and measles very often sttack the mucous membrane of the middle ear. In fact, EVERY CASE OF EXANTHEMATOUS DISEASE OR OTHER ACUTE INFECTION SHOULD SUGGEST CAREFUL EXAMINATION OF THE MEMBRANA TYMPANI AT EACH VISIT, TO FORESTALL TROUBLE. Much of the chronic ear disease and deafness of middle life is due to neglect of this precaution.

Treatment of mastoiditis is the same as for middle ear with the added caution to be on guard for indications that a mastoid operation is needed. I have had two severe cases of mastoiditis where the patient appeared in imminent danger of death clear up by persistent osteopathic treatment designed to improve drainage as explained.

IN THESE CASES, REMEMBER THAT YOU HAVE AT YOUR DISPOSAL THERAPEUTIC MEANS THAT ARE INFINITELY MORE EFFECTIVE THAN ANY MEDICINAL MEASURES AVAILABLE TO THE ALLOPATHIC AURIST. If the stage is reached where mastoid operation is needed have it done by the most competent ear surgeon or brain surgeon available, BUT KEEP RIGHT ON TREATING THE PATIENT, because the osteopathic treatment is fully as important as the operation. The operation only helps drain one part. Remember, pure blood and plenty of it is needed in the mastoid, middle ear and inner ear, and the way to get it there is to establish free drainage as explained. Know this part of the work IN DETAIL so that you can use it when the time comes.

The Nose and Sinuses in Eye Conditions

Each orbit is bounded medially by the frontal, ethmoidal and sphenoidal sinuses and below by the maxillary sinus, and separated from these sinuses by only a very thin plate of bone with only a thin mucous membrane within the sinus. Thus, a closed empyema of any sinus may be fraught with serious danger to the orbital structures. And this is further accentuated by blood and nerve supply being distributed from practically the same arteries and nerve trunks. Correction of nasal and sinus conditions results in marked improvement in vision, which, with supportive treatment in the upper dorsal and cervical regions, is permanent.

A similar thin plate of bone is all that separates the sphenoidal, ethmoidal and frontal sinuses from the cranial cavity. The cribriform plate of the ethmoid upon which rests the olfactory bulb, is extremely thin and perforated by numerous, foramina for passage of the olfactory nerves, and through these, infection is frequently carried from the nasal cavities to the cerebral meninges as the nasal mucosa is continuous with the dura mater at the foramina. Swelling of the middle turbinate can close the olfactory fissure in such a way as to prevent ventilation and drainage, making it a fertile culture medium for any pathogenic microorganisms that may lodge there. In this way the optic nerve may be affected within the cranial cavity.

The cornea has no trace of blood vessels except at its extreme margin. A fine network of lymphatic spaces serves to nourish it. When inflamed it becomes opaque, and the blood vessels, which encroach on it give a "salmon" tinge to it. In pannus, the continued irritation causes blood vessels to pass over the cornea just beneath the epithelial covering, but the cornea proper remains bloodless.

Blood to all eye structures is almost entirely from branches of the ophthalmic artery which arises from the internal carotid artery, just as that vessel is emerging from the cavernous sinus. In the orbit this artery is in relation with the lower border of the obliquus superior, rectus superior and levator palpebrae. Some of its branches go to the nose and accessory sinuses. Any irritation in the nose and sinuses to visceral afferent nerves is therefore reflected in dilatation of the ophthalmic artery and its branches. Lymphatic drainage of the nose and sinuses is largely through the retropharyngeal glands. Therefore, the first thing to do, to normalize the blood supply to the eye, is to thoroughly restore a normal healthy condition to the nose, sinuses, pharynx and neck, as well as to correct any upper dorsal or cervical lesions that might affect the sympathetic nerves in the grey lateral horn or in the superior or inferior cervical sympathetic ganglia.

Manipulation of the Eyeball and Adjacent Structures

Venous drainage of the eye is three-fold: into the cavernous sinus, pterygoid plexus, and anterior facial vein.

The lymphatic vessels of the eyelids and conjunctiva empty into the facial glands, thence into the parotid and submaxillary glands, which, in turn, empty into the upper deep cervical lymphatic glands. It is also to be borne in mind that the lymph spaces around the eyeball and within the fascia bulbi communicate with the subdural and subarachnoid spaces in the brain, and that any disturbance of the drainage of the cerebrospinal fluid will affect this drainage, notably brain tumor or meningitis. Gentle manipulation of the various glands will stimulate their activity.

Conjunctivitis is materially helped by gently stroking the lids along the orbital margins toward the inner canthus, as the conjunctival arteries, veins and lymphatics are all stimulated in this way.

Granulations are crushed between the index finger and thumb, the finger being aseptically clean and inserted beneath the lid, or with the lid everted. Dr. A. T. Still held that many eye conditions were due to hypertonicity of the orbicularis muscle, which he relieved by stretching the eyelid by inserting his finger beneath the lid and gently pulling. The lids may also be pulled from side to side.

The drainage of the eyeball and orbit can be improved by pressing the outer side of the tip of the little finger deep into the orbit and pushing the eyeball as far as possible in every direction. Dr. T. J. Ruddy, of Los Angeles, has devised the "Ruddy Eye Finger" to facilitate eye manipulation.

Treatment of conjunctivitis is mainly osteopathic. Drain and manipulate as described above. The conjunctiva cannot stand strong antiseptics. Even 25% argyrol when used for several months permanently discolors the sclera brown, known as argyria. Alkalol 50%, normal saline, saturated solution of boric acid, pure water, are usually the best eye-washes, to be applied by winking the eye in an eye cup. They should be ice-cold if given at the first stage of inflammation, otherwise as hot as can be borne. Cold compresses wrung out in ice-water, or just off the ice, may be also applied at the beginning of conjunctivitis, but ice should not be applied. Later in the conjunctivitis, hot compresses should be applied. A weak solution of zinc sulphate, ($\frac{1}{2}$ to 2%) is very effective in destroying the Morax-Axenfeld bacillus which is present in angular conjunctivitis and causes a tenacious grey discharge that glues the lid.

Always wear protective glasses whenever examining an eye that is glued shut, as the pent-up secretions may squirt into your own eye when you succeed in getting the lids separated a little.

Considering the various causes given by medical authors for cataract, glaucoma and other eye diseases which do not yield to medicinal therapy, it is easy to see how osteopathic lesions affecting the blood supply, nerve supply, venous drainage and lymphatic drainage are responsible for most of these cases. Many of these cases can be cured by osteopathy, plus hygiene. It is the duty of every osteopath to know enough about them to give the patient the right treatment or at least to refer him to the right specialist.

Dr. J. D. Edwards of St. Louis, Mo., in the May, 1920, A. O. A. Journal, described his original technique under the title of "Finger Surgery of the Orbital Cavity in the Treatment of Glaucoma." He states that "the results of this local manipulation in glaucoma in many instances were very gratifying. Muscae Volitantes, synechia of the iris, staphyloma, asthenopia, strabismus, incipient cataracts, retinal detachment, choroiditis, iritis, simple retinitis, refractive errors, uveitis, dacrocystitis, epiphora, blepharitis, conjunctivitis, optic nerve atrophy, have responded to this technique, and with the exception of the specific and malignant diseases, which should be carefully differentiated, almost every morbid condition of the orbital cavity can be benefited if not entirely cured." Dr. Curtis H. Muncie, of New York, in the October, 1921 A. O. A. Journal described additional finger surgery technique to correct errors of refraction by controlling drainage.

As a matter of fact, this technique secures far better results than any of the ordinary methods, such as eye-drops, eye-glasses, rest in dark rooms, etc. The discovery of Dr. Bates of New York is really osteopathic. Let's make the most of it. His medical confreres are as slow to take it up as they were to take up osteopathy. And osteopaths for forty years have been taking off peoples' glasses by simply normalizing the spine, whereupon the underlying cause of the strain was removed and the errors of refraction cleared up.

The circulation to the brain is interfered with by any lesion, bony, ligamentous, muscular, etc., which narrows the lumen of the spinal canal at the foramen magnum or further down. Such a lesion reduces the normal interchange of cerebrospinal fluid between the ventricles and the spinal canal at each heart-beat. Owing to the rigidity of the cranium, cerebrospinal fluid must leave the ventricles at systole as the arteries within the cranium dilate. If it does not, cerebral ischaemia, increased intracranial pressure, or congestion will occur. This tends

to irritate the vagus and autonomic fibres to hyperactivity, and to set up an irritability or instability reflexly from the cerebral cortex in every cell, tissue and organ in the body. Occipital or cervical lesions causing this condition must be corrected. Cerebral ischaemia may also result from insufficient heart action due to vasoconstrictor paralysis and lack of accelerator and augmentor impulses, caused by upper dorsal lesions, or to inhibition of sympathetic impulses over the vertebral and internal carotid arteries. The headaches, depression, and emotional instability of hay feverites are all markedly improved after correction of lesions in these regions.

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CHAPTER FIFTEEN

THE RELATION OF THE LYMPHATICS TO INFECTIONS AND TO MALIGNANCY

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The purpose of this chapter is to show the relation between lymph glands and infections, and also the relation between lymph glands and malignant diseases in various parts of the body. A focal infection may spread throughout the body along the lymph channels or through the blood stream. Where the infection travels along the lymph channels, we usually find the lymph glands involved, which involvement is characterized by an enlargement of the glands. This is probably a part of our defensive mechanism against the spread of an infection. The same thing also applies in cases of malignant disease. The cancer cells traveling through the lymph spaces attack the lymph glands in close proximity to the seat of the disease and this involvement is characterized by an enlargement of the glands. Cancer cells are also carried through the blood stream. I herewith report a number of cases that have recently come under our observation wherein the involvement of the lymph glands in the neighborhood of an infection or in some cases at a considerable distance from the primary infection was manifested by an enlargement of the glands and in some cases by their destruction, but in all cases of infection herein reported the infection was limited to the original focus and the neighboring lymph glands which, no doubt, performed the function of preventing a further spread of the infection even though the lymph glands were in some instances destroyed. In all cases of malignant disease where the lymph nodules were involved secondarily, there was no improvement except where the malignant focus was removed altogether with all lymph glands involved.

Case 1. A lad eight years old was brought to the hospital with a mild infection involving the right elbow. There was limited motion but not any great amount of pain or swelling. An X-ray picture did not show any involvement of the bone. A careful examination revealed a very active infection of both tonsils. These were enucleated and the adenoids removed cleanly. The infection in the arm became quiescent after a week or ten days. In this case undoubtedly the infection in the arm was secondary to the infection in the throat, and the infection reached the arm through the blood stream. The arm was given no treatment of a manipulative character except a very gentle

PLATE LXX.—Case 1.

massage. Hot applications, however, were applied for a few days. The special feature of this case, however, was an involvement of the lymph glands in the back of the head, four or five of the mastoid and occipital glands were enlarged to the size of a large hazelnut. They were not especially tender, however, on pressure, and were quite hard. There did not seem to be any relation between the enlargement of these glands and the infection in the throat, but there were several patches on the top of his head, some of them almost as large as a silver dollar, where there was an active infection with a sticky excretion which caused the hair to mat. These sores on his head were healed after about two weeks' treatment, which consisted of clipping the hair close to the scalp and cleansing the sores with soap and then putting on zinc oxide ointment. Undoubtedly this infection in his scalp was responsible for the enlargement of the glands in the occipital and mastoid regions, as the lymph vessels range from the top of the head downward. Following the healing of the sores on the boy's head, the enlarged lymph glands gradually receded. The accompanying illustration shows the lymph glands involved and the source of the infection. In cases of this kind, the enlarged lymph glands require no direct special treatment where the glands have not broken down. Where the primary focal infection is cleaned up, the glands will recede to normal size. Where the glands have suppurated, drainage by incision is necessary.

Case 2. The patient, a girl about 15 years of age, had a swelling on the right side of her neck nearly as large as a hen's egg. The lump was immediately in front of the sternomastoid muscle and the top of it was about on a level with the angle of the jaw. This swelling persisted for a number of months. It appeared to be a single lymph gland greatly enlarged, although there may have been several glands which had coalesced. There seemed to be no tendency for the enlargement to recede. The patient gave a history of having had a considerable amount of throat infection, although at the time the case came under our observation the throat seemed to be fairly clean. The question arose as to the nature of the swelling and as to the best treatment to apply to reduce it. As the parents of the child were adverse to operation, an attempt was made to reduce the swelling by treating the neck osteopathically, and also by the use of applications such as antiphlogistine, hot water, etc. This treatment, however, was carried on without success. Next the swelling was incised and a considerable amount of pus evacuated. A drain was introduced and this treatment for the time being reduced the swelling to a considerable extent. After a time the drain was discarded and the incision healed, but in a short time the gland swelled up again as large

PLATE LXXI.—Case 2.

as it was before treatment. We next opened the abscess and after draining out a considerable quantity of pus, injected the cavity with bismuth paste. This treatment after being tried for a couple of months proved to be unsuccessful. Finally, under an anesthetic, the swelling was opened freely and the wall of the abscess dissected away. The wound was drained for a few days only and healed readily without any further recurrence of the trouble. I do not believe this infection was tubercular in character as the infection was limited to one area. The glands in this case were secondarily involved from an infection in the throat of a pyogenic character.

Tuberculosis of the lymph glands is characterized usually by the fact that a considerable number are involved, and in the beginning the glands are very hard and do not enlarge rapidly. I might add in this connection that as a rule tubercular glands, if the proper hygienic treatment is carried on, will recede without surgical interference. As a rule, enlarged lymph glands in the neck in front of the sternomastoid muscle and below the jaw, where the condition is due to acute or chronic tonsillitis, will recede to a normal state after the condition in the throat is cured, whether by operation, as the removal of the tonsils, or by other means. We do not consider it wise as a rule to manipulate an enlarged lymph gland. The treatment should be directed to the cause of the trouble and the gland itself requires no treatment of any character except perhaps local applications, unless the enlargement is considerable and persists for some time or unless the gland suppurates and breaks down. In the case of suppuration, usually drainage is all that is required. Occasionally excision as in the present case will be necessary.

Case 3. A lad 10 years of age injured his leg about six inches above the ankle by striking it against the tongue of a cultivator. The injury at the time was considered trivial, although it was somewhat painful for a few minutes. No attention was paid to the bruise for a week or ten days, when the lad developed a considerable swelling at the place of injury and also complained of pain. An attempt was made at treatment by home remedies and bandaging, but there was no improvement, and after about a month the boy was brought to the hospital at which time he was running a little temperature and the pain in the leg, although not severe, was enough to cause him considerable annoyance. There was a swelling at the site of the injury and the skin was considerably discolored for an area of several inches. Although the skin was not broken at the time of injury, there was evidently an infection here which was characterized by a soft swelling, discoloration of the skin and temperature. The infection was evidently carried to the involved tissues through

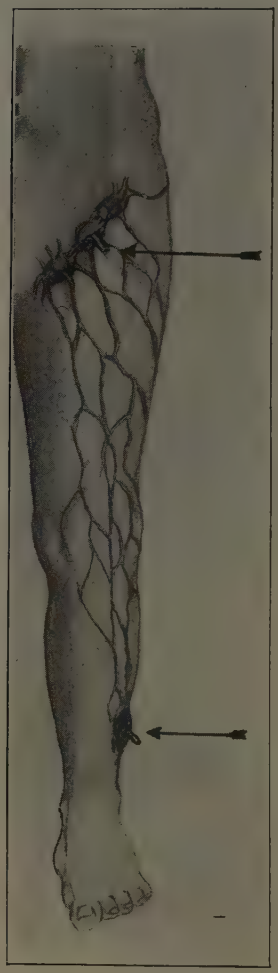

PLATE LXXII.—Case 3.

the blood stream, gaining entrance to the body probably through the throat, although there was no history of any special throat trouble. The infection proved to be quite superficial, lying between the fat and down upon the fascia overlying the muscles just a little outside of the tibia. This was incised for a couple of inches and a considerable quantity of pus escaped. The cavity was curretted and drained. It healed in about two weeks.

The special feature of this case, and for which it is principally presented, was the involvement of the inguinal lymph glands. These glands were enlarged, some of them to half the size of a hen's egg. One gland had suppurated and required incision for drainage. Following the drainage of the abscess in the leg and the incision for drainage of the lymph gland that had suppurated, the balance of the glands receded to normal size in about ten days. The only treatment was rest in bed. Undoubtedly infection from the leg in this case followed along the lymph channels until the lymph glands in the groin were reached, and here the infection was limited. The accompanying illustration shows the route the infection travelled to reach the lymph glands in the groin. It is not uncommon for an infection in the foot, particularly an infection from an ingrown toe-nail, to cause an involvement of the lymph glands in the groin.

Case 4. I wish next to report a case of involvement of the deep lymph glands along the external iliac vessels. The case was unusual for the reason that the glands were so large that they had been mistaken for a fibroid tumor of the uterus. This patient, a young woman about 30 years of age, had given birth to a child about three months before she came under our observation. There was a history of unsatisfactory convalescence following delivery. The patient had never been well enough to nurse her baby. On examining the case after she was brought into the hospital, we found a large solid growth extending a little past the mid-line of the abdomen on the right and up to within two inches of the umbilicus, and then extending clear over to the left side forming an immovable mass. The superficial lymph glands in the inguinal region were also enlarged. There was a slight discharge of pus from the uterus; she was running an irregular temperature. An incision was made over the mass but without opening the peritoneal cavity, as the mass below was attached to the abdominal wall. A finger was inserted down into the mass and a large quantity of pus escaped. A drainage tube was then introduced and left in the wound until drainage ceased and the mass reduced. This required about three weeks. The patient made a very satisfactory recovery although the wound was slow in healing, a little

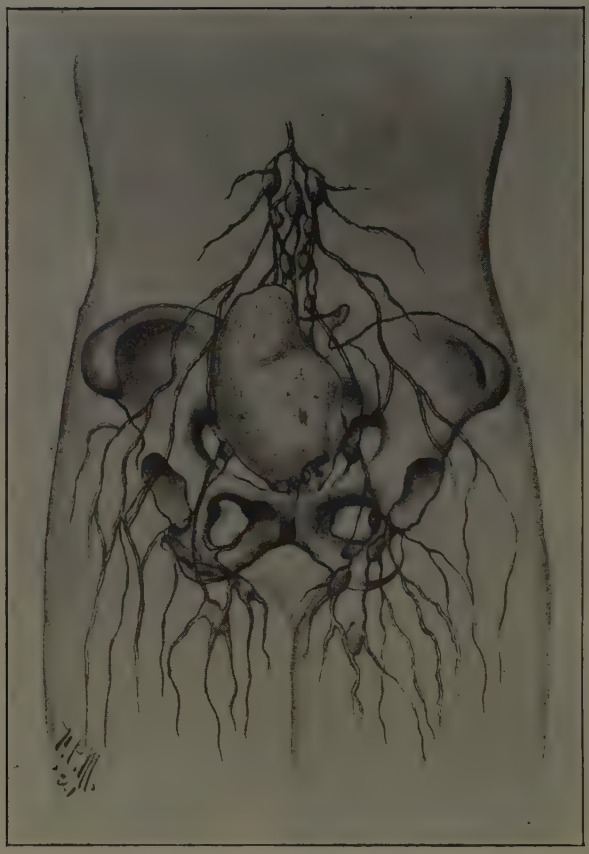

PLATE LXXIII.—Case 4.

discharge occurring for four or five weeks. The entire mass, however, entirely disappeared after six weeks.

The infection in this case undoubtedly came from the uterus and occurred in connection with delivery, due probably to the introduction of unclean hands or instruments into the vagina or uterus. When I first saw the case I was somewhat in doubt as to whether or not there might be a malignant condition. When the mass was incised and pus escaped, I was then satisfied that we had only an infection to deal with. The subsequent history of the case demonstrated this to be true. The accompanying illustration shows the lymph drainage from uterus and the lymph glands along the iliac vessels. The reason cancer of the uterus is so frequently ultimately a fatal disease is on account of the involvement of these lymph glands, which cannot always be entirely removed, even though wide dissection of the parametrium is made at the time of operation for the removal of the uterus. Where malignant lymph glands remain after the removal of the uterus, the disease recurs.

Case 5, is that of a young man about twenty, an ex-soldier. He was brought to the hospital for treatment for a disabled hip. He was unable to walk due to the disability and it was thought that perhaps the condition was one which might be relieved by some sort of treatment. The history was not clear except that the hip had grown progressively worse following a slight injury. At the time we saw the case the hip was enlarged from the crest of the ilium down to six or eight inches below the great trochanter. There was an especially large swelling in the gluteal region. Both the deep and superficial lymph glands in the groin and abdomen on the same side were extensively enlarged. There was a firm mass here which extended well into the abdomen. The young man had lost considerable weight, but so long as he was quiet in bed there was little or no pain. There was no temperature. An incision was made over the large mass in the gluteal region and a large quantity of broken down, flesh-like material removed. The object of the operation was to determine the character of the growth. No pus was present. An examination of the tissue proved it to be sarcoma which probably had originated in the region of the hip, either in the soft tissues or from the bone. The involvement of the lymph glands, of course, was entirely secondary in this particular case. The wound was sutured and healed without any trouble. The disease, however, progressed steadily and the young man was sent home. He died about two or three months later.

This case serves to illustrate the involvement of lymph glands in malignant disease. The glands involved are those adjacent to the seat

PLATE LXXIV.—Case 5.

of disease. The object of the incision was to determine whether the disease in the hip was malignant or due to infection. It was quite evident, however, even before operation, that the condition was malignant, but as there was no risk in making the incision it was done with the hope that the condition might prove to be an infection, in which case an improvement could have been expected from treatment.

Case 6. This case is given for the purpose of illustrating the involvement of axillary lymph glands. The patient, Mrs. M., 55 years of age, was examined only recently for an enlargement in her breast. It was a single lump about the size of a walnut just a little to the outside of the nipple. The lump had given her considerable pain, and there had been a discharge of blood and serum through the nipple for a couple of months. The lump, however, was not attached to the skin nor to the muscle beneath. Upon examining the axilla, we found a few lymph glands slightly enlarged. The patient was considerably distressed about the condition and thought it might be malignant. I was inclined to believe that it was non-malignant, but recommended operation. The breast was removed and the axilla cleaned out, stripping out the fat and the lymph glands along the axillary vessels. The tumor was cut open and proved to be a broken down cyst. The cyst had become infected and the lymph glands were enlarged secondarily to the infection. There was no evidence of malignancy, although conditions of this kind if allowed to run often become malignant, and for that reason the operation was advised.

In this case it was not found necessary to remove the pectoral muscles. The patient, of course, has experienced a great deal of relief both in mind and body following the operation and may, of course, expect permanent relief without fear of recurrence.

I wish in this connection to report a case of carcinoma of the breast in a woman of about 60 years of age where the condition had existed for over a year. The skin for about an inch about the nipples had broken down and there was a large lump as big as one's fist in the middle of the breast. The lymph glands in the axilla were palpable, some of them as large as a small sized hickory nut. The lump, however, was movable. In this case a very wide incision was made and the breast and pectoralis major and minor muscles were removed down to the ribs. The fat and lymph glands were removed from the axilla for a considerable distance. Whether or not the operation will eventually prove successful depends, of course, upon whether or not all of the lymph glands containing cancer cells were removed. There did not appear to be any involvement of the tissue outside of the breast itself excepting the skin about the nipple and the lymph glands. The wound healed readily

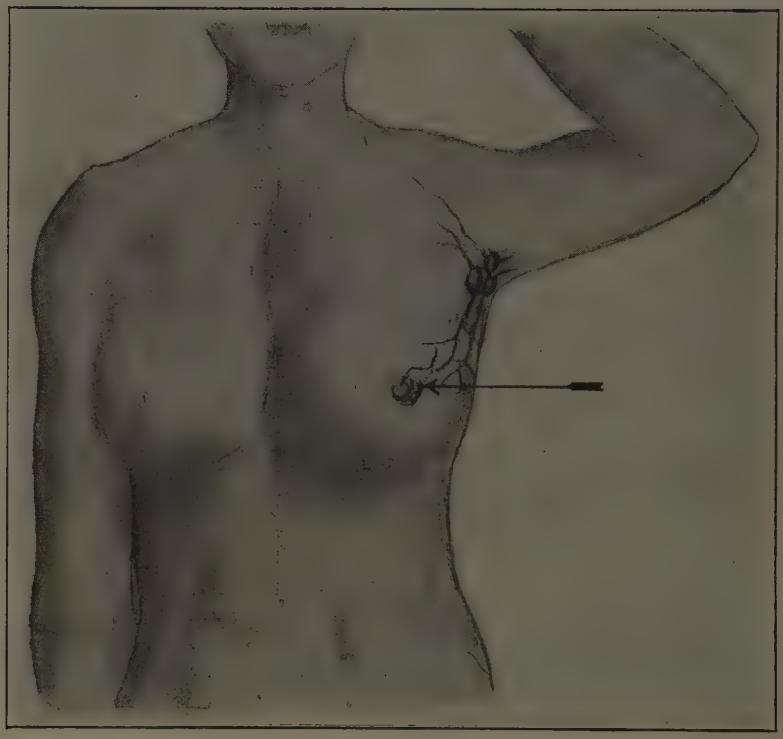

PLATE LXXV.—Case 6.

and the patient regained good use of the arm. The operation was performed only a year ago and to date there has been no recurrence. We are not safe, however, until a number of years have elapsed in saying that the disease has been entirely eradicated.

I recall one case of cancer of the lung which developed 10 years after the removal of the breast. I recall another case in which the breast and lymph glands had been removed and where the disease recurred several years later in the axillary vessels and nerves, resulting in obstruction of the circulation to the arm and intense pain due to the encroachment of the disease upon the nerves.

In cancer of the breast unless the operation is comparatively early and the breast and underlying fascia and axillary lymph glands are completely removed, the disease is very apt to recur. The most common site of recurrence is in the axillary tissue, but not infrequently metastatic cancer appears in the lung, pleura, spinal column or brain. The accompanying illustration shows the lymph drainage from the breast and the way by which the lymph glands in the axilla become involved at a comparatively early date following the appearance of malignancy of the breast.

CASE 7. This case, Mrs. C., aged 58 years, came to the hospital for examination giving a history of having had stomach trouble for about a year. Her general condition seemed fairly good although she had lost some weight. There had been more or less distress for a number of months after eating and she had for some months vomited quite a good deal, although for several months just preceding the time of examination there had been very little vomiting. A barium meal was given and the patient's stomach examined with the fluoroscope. There was quite an extensive filling defect along the region of the lesser curvature. As the patient was rather heavy, nothing of a very definite nature could be determined upon palpation except that the stomach was tender. An examination of the stomach contents was not made. The diagnosis of obstruction was made from the fluoroscopic examination and it was thought that the condition was either cancer or obstruction due to old ulcers. An exploratory operation was advised and accepted by the patient. An incision was made in the mid-line between the ensiform and umbilicus and the stomach examined. There was an extensive cancer which involved practically all of the lesser curvature and extending well down toward the great curvature. The stomach could not be brought out through the wound. The lymph glands, particularly along the lesser curvature, could be palpated. On account of the extensive nature of the disease, no attempt was made to resect the stomach. There was no evident involvement of the liver. The wound was

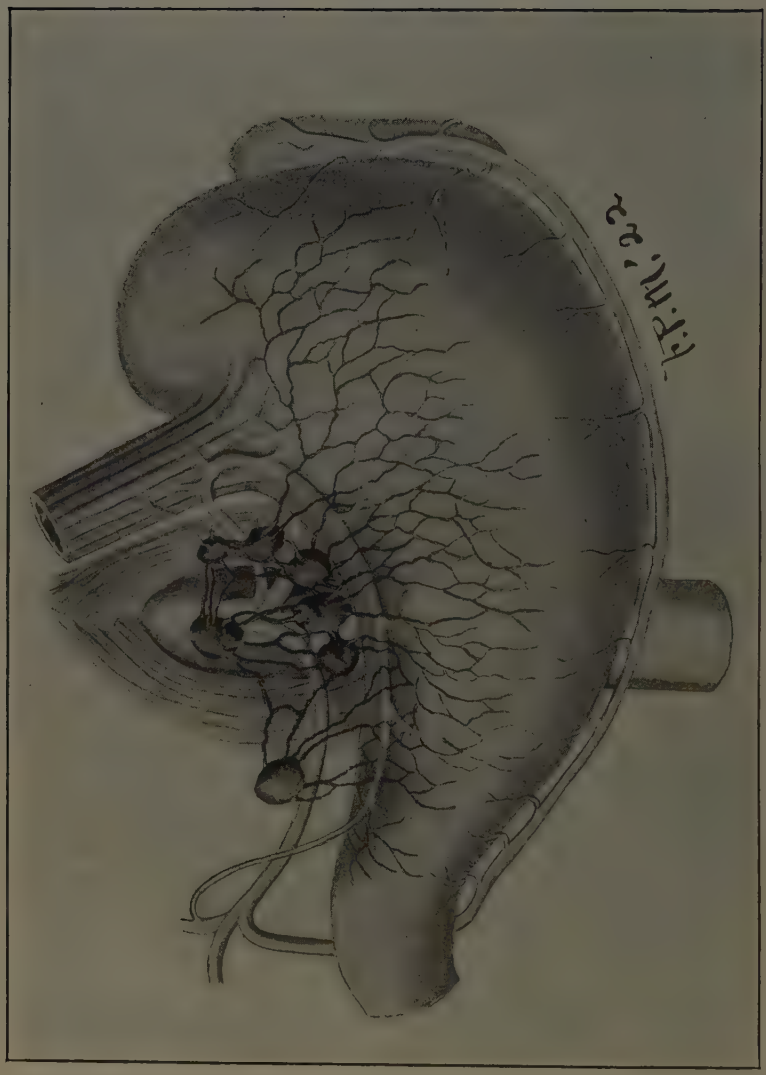

PLATE LXXVI.—Case 7.

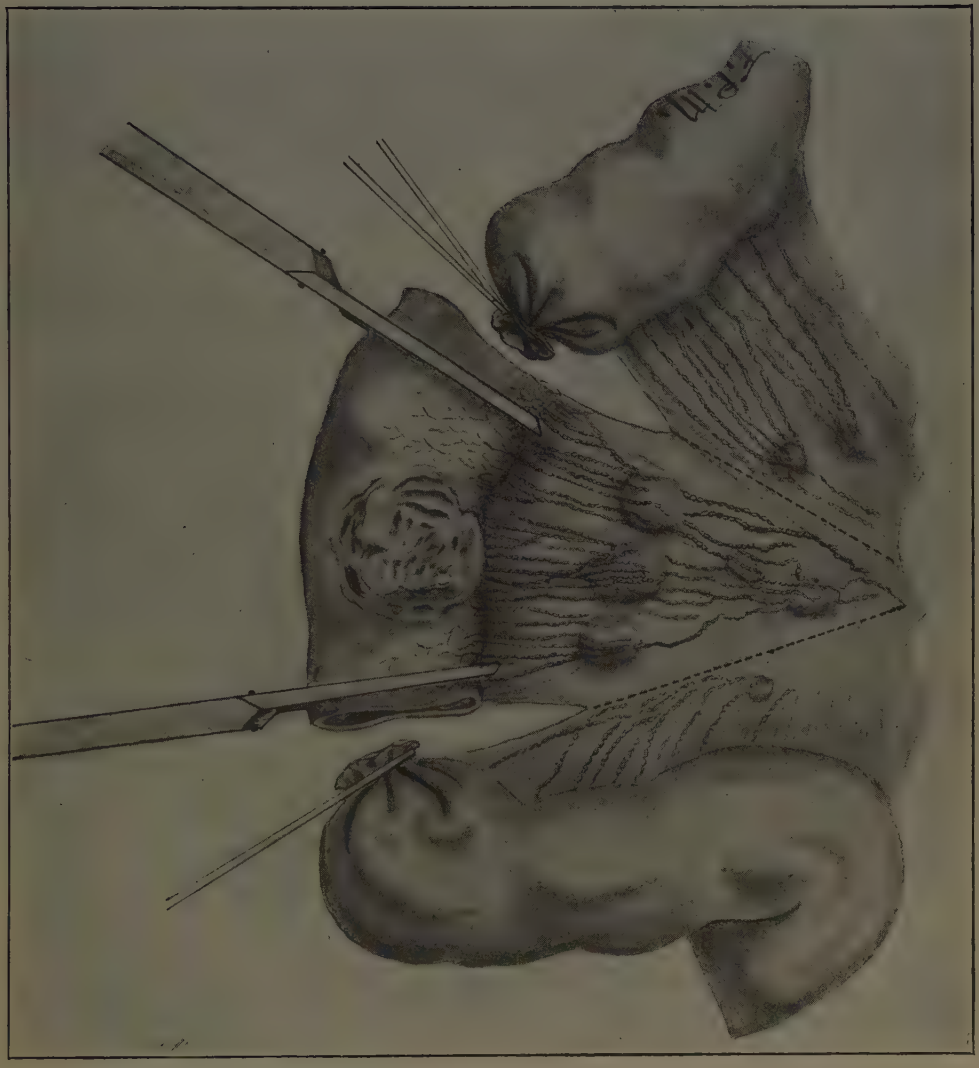

Plate LXXVII.—Case 8.

sewed up and the patient recovered from the operation and left the hospital in three weeks.

This case is reported to show the futility of attempting to resect the stomach except where the operation is done early and while the disease is still confined to a small area, which, together with the adjacent lymph glands, can be removed by resection. The accompanying illustration shows the blood supply to the stomach, its lymphatics, and adjacent lymph nodules. Along the lesser curvature the lymphatics run in a direction away from the pylorus to terminate in the nodes along this border of the stomach. Along the greater curvature, the drainage is towards the pylorus.

CASE 8. Mrs. M., age 60, had been under a doctor's care for three months previous to the time she was referred to me. The nature of her trouble had not been determined, although she had lost considerable weight and had suffered a great deal from distention of the abdomen, vomiting and constipation. Her condition became rapidly worse for a week preceding the time she was brought to the hospital. Upon examination we found her abdomen distended and upon palpation found a small lump low in the abdomen on the right side which could be moved about. The patient had not been able to retain food for almost a week. There was evidence of obstruction of the bowel, the nature of which we were unable to determine at the time of examination. Operation was recommended which was performed as soon as the patient could be prepared. The abdomen was opened with a right rectus incision and upon exploring we found an obstruction in the small intestine which proved to be a growth inside of the gut which almost completely obstructed it. The lymph nodes in the mesentery were also involved. About six inches of gut were resected and a "V" shaped section of the mesentery removed back of its posterior attachment. Both ends of the bowel were closed by purse-string suture and a lateral anastomosis performed. The patient made a very good recovery and has been well up to date, two years following the operation. An examination of the tumor proved it to be carcinoma. The probabilities are that the patient will have no recurrence, but we cannot positively state this to be true until several years more have elapsed. This case is presented for the purpose of showing how cancer of the colon or small intestine involves the lymph glands of the mesentery, and an operation, unless it is sufficiently wide in resection of the gut and mesentery to include all of the involved lymph glands, there is certain to be early recurrence of the disease. The accompanying illustration shows the extent of the involvement of the lymph glands in this particular case and the rather wide resection necessary for their removal.

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